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VETERINARY JOURNAL

Editor:

FREDERICK HOBDAY, C.M.G., F.R.C.V.S., F.R.S.E.,
HONORARY VETERINARY SURGEON TO HIS MAJESTY THE KING,
OFFICIER DU MÉRITE AGRICOLE (FRANCE),
CAVALIERE DEI SS. MAURIZIO E LAZZARO (ITALY),
HONORARY MEMBER OF THE AMERICAN VETERINARY ASSOCIATION,
PRINCIPAL OF THE ROYAL VETERINARY COLLEGE, LONDON.

Sub-Editor:

GLADSTONE MAYALL, M.R.C.V.S.

JULY, 1932.

HIS MAJESTY THE KING'S GRACIOUS THOUGHT FOR VETERINARY SCIENCE.

As the readers of THE VETERINARY JOURNAL and other members of the veterinary profession are well aware, the London Veterinary College has recently been making very strenuous efforts to raise the necessary funds to save itself from extinction; and to erect, equip, and endow the necessary Departments which are integral and essential parts of such an Institution—not merely as a private teaching establishment, but as an Institution whose value as a training ground for students and graduates in Veterinary Science is of National importance, and essential to the welfare of the Empire. These efforts are at last bearing fruit, and although there is still a long way to go, there is evidence that the goal which was set in front about four years ago, *viz.*, to obtain £250,000 for buildings, and another £250,000 for endowment, will eventually be attained.

Recently, as the result of a representation made by an influential body of sportsmen who know the dire necessity of the London College, Mr. J. S. Elias, the Managing Director of Odham's Press, which controls a very widely read group of newspapers, issued an appeal in the *Daily Herald* to the readers to assist in raising a minimum sum of £25,000.

The urgency of the matter was brought to the notice of His Majesty the King, whose personal interest in everything to do with the welfare of agriculture and stock breeding is so well known, with the result that the following letter was sent to the Principal of the College from Sir Frederick Ponsonby, Keeper of the Privy Purse:

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" The King was much interested to hear that steps were being taken to place the Royal Veterinary College on a firm financial footing. His Majesty, as Patron of the College, is well aware of the importance of the work that is being carried out at the College, and knows how essential veterinary science is to both agriculture and horse breeding, not only in this country, but throughout the British Empire.

" The King is glad to learn that an appeal for funds in aid of the College has been started, and feels sure that it will meet with a generous response from all lovers of animals.

" I am concerned to forward you the enclosed cheque for £100 as a donation from His Majesty to this fund."

The lead thus given will not only be followed by success, but it will encourage new effort, not only on behalf of the Institution which it was primarily intended to benefit, but for the whole question of Veterinary Research, which has been so terribly neglected in recent years.

THE INTERPRETATION OF "VETERINARY SURGEON" IN THE IRISH FREE STATE.

THE lead as to how to protect the rights of the veterinary profession (in so far as the British Empire is concerned) emanated from the Irish Free State, when the Veterinary Surgeons Act of 1931 was passed by the Dail Eireann, and the first prosecution by the Veterinary Council of Saorstat Eireann was brought to a successful conclusion in Athenry District Court on June 16th. The details are given on another page in this issue of the Journal.

This case forms a most important precedent, and will not only be a great deterrent to unqualified practice, but its importance from the point of view of humanity towards the animal, whose care when sick is in this country so often placed in ignorant, though sometimes well-meaning, hands, cannot be over-estimated.

In Spain a similar law has existed for some time, and it is good to realise that at last there is, in the Irish Free State, one branch of the British Empire where the sick animal is adequately protected. It is to be hoped that Great Britain herself will make some effort to follow suit; for the mushroom-like growth of spuriously termed " humane " societies, *from whose ignorant experiments when sick the poor animal has no chance of appeal*, forms a subject of reproach against the tenets of a nation whose innate love of fair play for animals is proverbial. Truly " more harm is caused by want of thought than by want of knowledge."

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General Articles

VETERINARY SCIENCE IN CZECHOSLOVAKIA.

By Prof. Dr. TOM VACEK, M.V.Dr.

Director of the Department of Physiology, Veterinary University College, Brno, Czechoslovakia.

THE new Veterinary University College in Brno, Czechoslovakia, was founded in December, 1918, by one of the first laws of the new Czechoslovak Republic. It was also the first school of university degree founded in the new State, which is a good appreciation of the importance of the veterinary service. The Veterinary University College is the only school of this kind in Czechoslovakia. It was organised, especially in the first place, on the pattern of the German schools, but later it has been built on the ideas of the new progress of veterinary science, and with regard to the particular circumstances and need of the Czechoslovakian country.

The Veterinary University College is an independent High School. It has no relation to the University (Masaryk University) in Brno or to any other school. The universities in Czechoslovakia are only a type of " high schools." Besides these, there are some other High Schools of the same degree, which name signifies their kind. Among these we have the Veterinary University College.

The Veterinary University College is, as are all the High Schools, a State School. It was founded and is built and maintained by the Government. The professors of the College are appointed by the President of the Republic in accordance with the method of appointment of the professorial staff of the College, the Ministry of Education and the Government. They are State Officers. The professorial staff, with a Rector at the head, is a body which direct the development of the College and its administration. " Rector benificus " is elected every second year from and by the professorial staff. His term of office lasts two years.

Brno, the second capital of Czechoslovakia, was chosen as the residence of the Veterinary University College. Moravia, the capital of which is Brno, is a country of a particular agricultural type. It is not at all a disadvantage that the College is not in Prague, the capital of the State, because Brno, like Prague, is a scientific centre with a university (Masaryk University), a Technical High School, and an Agricultural College, besides many other scientific bodies. The College is situated direct in the city. Seventeen departments and clinics form the College. There are: Departments of Anatomy, Physiology, Chemistry, Histology and Embryology, Biology, Botany, Pharmacology, Zoology and Parasitology, Hygiene of Meats, Pathology, Bacteriology, Gynæcology, Zootechnics, and Food and Feeding, with clinics of Medicine, Surgery and Obstetrics. Some

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of these departments are equipped satisfactorily, but some are just at present new buildings, and some others are situated in improvised rooms, waiting for their own buildings. The development of the College, which started in the earlier years quite satisfactorily, has, however, latterly been delayed in consequence of the present unfavourable economical situation of Czechoslovakia.

The course of study lasts four years, but practically it works out at five years at least. Each year is divided into two sessions, the winter and summer respectively. The winter session begins in October, the summer session begins in the middle of February and lasts until the end of June. The division of the work during this study will not be particularly quoted, because veterinary study is at present in a state of reorganisation. The chief idea of this reorganisation is to divide and arrange all work according to its importance, and to bring it up to date in modern veterinary science. It has been found, however, that the period of four years is not satisfactory, and therefore the period of study will be increased to four and a-half years. The entire study will now last five and a-half years at least, because the chief examinations will be done after the finish of the ninth month, and take leave of absence one year.

The qualified man has the title "Veterinary Surgeon," which entitles him to practice. The degree "M.V.Dr." is granted to a veterinary surgeon after further graduation by a thesis and a post-graduate examination. For the post-graduates there are some special courses for different purposes, which, however, do not add any special official degrees.

PRELIMINARY STUDIES IN THE TICK TRANSMISSION OF LOUPING-ILL.

(I) Review and Analysis of Previous Transmission Experiments; (II) A Study of the Reaction of Sheep to Tick Infestation.

By J. MACLEOD.

From the Moredun Institute, Gilmerton, Edinburgh.

Section I.—Review and Analysis of Previous Experiments.

It has long been suspected that the sheep tick, *Ixodes ricinus*, is concerned in the transmission of louping-ill in sheep, and many attempts have been made during the last fifty years to incriminate it as the carrier of the causal agent of this disease. The results obtained have been, however, of a conflicting and inconclusive nature. Williams (1897) recorded an experiment in which a sheep infested with ticks obtained from an affected farm died after having developed symptoms typical of louping-ill. Meek and Greig Smith (1896), Hamilton (1906), and Stockman (1916) conducted experiments in which muzzled sheep were exposed on affected pastures, together with unmuzzled control sheep. The results of these various experiments have been summarised by Stockman

PLATE I

The Veterinary University College at Brno, Czechoslovakia.
(See page 275)

FIG. 1.—Bull "Jacky" at age of 17 years.
(See page 300)

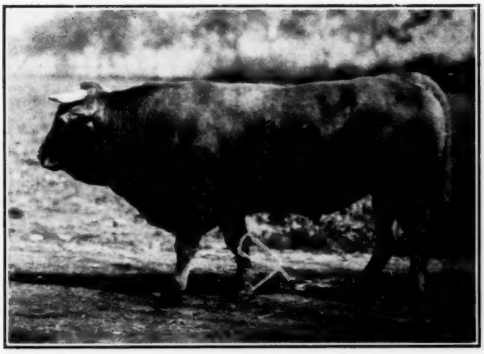

FIG. 2.—Bull "Jacky" at age of 20 years.
(See page 300)

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as follows: "Thirty-nine control sheep were exposed without muzzles. Of these, 17 (45.5 per cent.) became affected, and 12 (30.7 per cent.) of the 39 died of louping-ill. The muzzled sheep numbered 25, of which 2.8 per cent. became affected and died. A much higher death-rate amongst the unmuzzled sheep is evident. It does not, however, seem possible to draw firm conclusions in relation to the tick theory from the results."

Stockman carried out numerous infestation experiments with presumably infected ticks. In 1916, he recorded a series of experiments involving the infestation of forty sheep with ticks which had been exposed to infection in a previous stage of their life cycle. No symptoms suggestive of louping-ill developed in any of these sheep. In 1918, he described an experiment in which larvæ, the progeny of female ticks obtained from affected sheep, were allowed to feed on a lamb. Signs of uneasiness were observed on the sixth day, and on the following day the lamb was unexpectedly found dead.

Stockman's Temperature Reactions.—Prior to the end of the series of experiments referred to above, observations of the experimental animals had been confined to the consideration of symptoms of locomotor disturbance. In 1918, Stockman recorded a series of infestation experiments in which the temperatures of the experimental animals were taken daily. As a result of these experiments he claimed to have produced a thermal reaction in sheep by infestation of these with presumably infective ticks, and he concluded that this reaction was a symptom of louping-ill. These experiments are of considerable importance, and will be treated in some detail.

Four sheep were infested with larvæ bred from "infected" female ticks, *i.e.*, females collected from cases of louping-ill. Two of the sheep remained unaffected; one developed an indefinite temperature reaction after the seventh day, the temperature remaining for some days between 104° F. and 105.6° F. The sheep showed slight symptoms of malaise. The fourth sheep developed a temperature reaction after the fourth day, and showed symptoms of general uneasiness. Blood from this sheep produced a rise of temperature within twenty-four hours when inoculated intramuscularly into another sheep. The reaction persisted for seven days, whereupon the animal was destroyed. Subcutaneous inoculation of blood from this sheep into two other sheep produced no reaction. Two sheep were infested with adult ticks bred from "infected" nymphs. One of the infested sheep did not react. The other developed a marked temperature reaction after the twelfth day, and exhibited symptoms of uneasiness. One hundred c.c. citrated blood from this case, when inoculated subcutaneously into another sheep, caused a rise of temperature which began on the fourth day, and was accompanied by symptoms of uneasiness.

Larvæ and nymphs were infected by allowing them to feed on a sheep which was reacting to an inoculation of blood obtained from a field case of louping-ill. These ticks were bred to nymphs and adults respectively, and were then allowed to engorge on a clean sheep. Seven days after infestation the sheep developed

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a thermal reaction accompanied by symptoms of uneasiness. A number of nymphs were allowed to gorge on a sheep reacting to an inoculation of blood from a suspected case of louping-ill. The adult ticks resulting from these were allowed to feed on a sheep ten months after they had moulted, and produced a temperature reaction which began on the eighth day. Subcutaneous inoculation of blood from this case caused a temperature reaction in a healthy sheep after the third day. A number of nymphs were allowed to feed on a sheep which was reacting to an inoculation of blood from a suspected case of louping-ill. The adults bred from these were infested on sheep at intervals of varying length after moulting.

(*a*) Some were allowed to feed on a sheep immediately after they had moulted. The sheep remained healthy.

(*b*) Two lots, fifteen days after moulting, were allowed to engorge on two sheep, both of which remained unaffected.

(*c*) The remainder were allowed to engorge on a sheep fifty-eight days after they had moulted. This sheep developed a temperature reaction which began on the tenth day. Symptoms of malaise were exhibited.

In the discussion of his results, Stockman stated: "... it follows ... that larvæ from females which as adults engorged on affected sheep can give rise to a highly febrile and sometimes fatal disease in other sheep, when put to feed upon them in very large numbers, and that adults fed as nymphs on affected sheep may have the same effect. ..." He concluded that the disease which he thus produced was louping-ill.

Discussion.

The temperature reactions obtained by Stockman as a result of infestation of sheep with ticks are of considerable significance. Although no case of typical louping-ill resulted from the infestations he carried out, it does not necessarily follow that the reactions he obtained were unrelated to louping-ill. It is generally believed by flockmasters that the number of cases of acute louping-ill which develop in a flock exposed to infection is low in comparison with the number of mild cases in which no locomotor symptoms are apparent. It is possible that some at least of the reactions obtained by Stockman represented a mild form of louping-ill infection. Certain points in connection with Stockman's results have not, however, been clearly established, and these require further elucidation. (1) Some of the temperature reactions recorded by him cannot, in the absence of controls, be considered to be definitely indicative of infection. It is conceivable that they were due to adventitious causes, since the temperature of a sheep may rise to above 105°F. as the result of handling or excitement. (2) Further, he did not succeed in transmitting any of the reactions to two or more sheep in sequence, and it is therefore uncertain whether the reactions resulted from infection by a living agent. (3) His omission to include control infestations with "clean" ticks leaves still further doubt as to the nature of the reactions, since, in the absence of this control, they could be considered to be due to irritation from the tick bites, or to the introduction of some chemical irritant present in the salivary

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secretion of ticks. (4) Finally, if it be admitted that he showed the tick to be capable of causing an infective febrile condition in sheep, the objection remains that he did not establish the identity of this fever with louping-ill. None of the reactions he produced was followed by symptoms typical of louping-ill. There is even reason to doubt whether the ticks he used had been in all cases exposed to infection with louping-ill virus, since Stockman was not in a position to differentiate as accurately as is now possible between true louping-ill and conditions bearing clinical resemblance to this disease. A proportion of his material may therefore have been collected from field cases of diseases other than louping-ill.

Section II.—A Study of the Reactions Produced by Ticks Obtained from Louping-Ill Districts.

In view of the interesting febrile reactions obtained by Stockman, it was desirable that a careful study of the reaction of sheep to tick infestation should be made in order to determine the following points: (1) Can ticks cause a febrile reaction in sheep? (2) If such a reaction occur, is it due to irritation, or to an infective agent transmitted by the tick?

In the event of any of the experimental sheep developing a febrile reaction without manifesting subsequently clinical symptoms of louping-ill, it was hoped that the identity or non-identity of this reaction with that of louping-ill could be determined by immunity test, since recent work at this Institute has shown that a sheep which reacts thermally to louping-ill infection and recovers, will not react to a subsequent inoculation of virus into the brain (Greig, Brownlee, Wilson, and Gordon, 1931).

The sheep used for the infestation experiments had been reared in districts where the sheep tick was not found. A field was kept exclusively for the sheep under experiment, so that there was no contact between these and experimental cases of louping-ill. Care was taken to render the handling of the sheep each day subject to as little variation as possible. In carrying out sub-inoculations of blood from reacting sheep, only small quantities of blood (10 c.c. or more usually 5 c.c.) were used.

Can Ticks Cause a Febrile Reaction in Sheep?—A farm was chosen in the Ettrick valley, where louping-ill is prevalent, and unfed ticks were collected from pastures on which cases frequently occurred. Considerable numbers of nymphs and larvæ were obtained, and were infested on sheep at Moredun. In this way it was hoped that Stockman's febrile reaction might be reproduced.

Experiment I. Ewe 901.—Nymphs and larvæ were collected from the pastures in May, 1930, and brought to Moredun. On May 19th, some of these ticks were allowed to engorge on a greyface ewe, No. 901, which had been brought from a district where louping-ill was unknown. The ewe, along with a control sheep, had been kept in the experimental field since May 15th, their temperatures being taken daily, and in both cases the temperature had remained within the normal range. The ticks were placed in contact with the ears and forelegs by means of earbags, and of cloth sleeves on the legs. About twelve nymphs and numerous larvæ attached themselves. On May 24th, that is five days after infestation,

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the temperature of the test sheep rose to 106.8° F., and on the following day reached 107.8° F. At this stage the ewe was distinctly uneasy. It was seen to lie down frequently with the head resting on the ground; its respiration was hurried and panting. During the following six days its temperature remained over 106° F., and then declined to normal. It developed no locomotor symptoms, such as those found in cases of typical louping-ill. The temperature of the control sheep, which was subjected to exactly the same handling, remained below 104° F. Ten days after recovery from its thermal reaction, sheep No. 901 was tested for immunity to louping-ill by intracerebral inoculation of louping-ill virus, and died of typical louping-ill.

Experiment II. Ewes 908, 780, 893 and 924.—Other individuals of the same lot of nymphs and larvæ as those which had engorged on ewe 901 were placed on the ears and legs of a greyface ewe, No. 908. This ewe and a control ewe had been under observation during the previous week. Their temperatures were taken daily. On the fourth day after infestation the temperature of ewe 908 rose to 106.6° F., and reached 108° F. on the following day. The ewe showed the same symptoms of uneasiness as ewe 901, but in a more intense degree. On the eighth day it was obviously ill. It lay apart from its fellows with its head resting on the ground. During the next four days its temperature remained over 106° F., and then declined to below 104° F., the ewe recovering its normal brightness. There was no paralysis. The temperature of the control sheep remained below 104° F. Ten days after its temperature had returned to normal ewe 908 was tested for immunity to louping-ill by intracerebral inoculation of virus. Typical louping-ill developed.

That the temperature reactions in ewes 901 and 908 were due to the tick infestations is clearly shown by the controls. Previous to infestation, and during the first few days afterwards, all four sheep, receiving the same treatment, reacted similarly in regard to temperature fluctuation. Thus, on May 17th, on which day some difficulty was experienced in penning the sheep, the temperatures of all four rose to over 105° F. Throughout the preliminary period of observation the four temperature curves corresponded closely. After infestation, the two tick-infested sheep developed thermal reactions similar to each other in character, while the two controls remained normal (*see* Chart).

On May 26th, that is, when the temperature reaction was at its acme, 8 c.c. of blood were drawn from ewe 908 and inoculated subcutaneously into ewe No. 780. On the third day after inoculation the temperature of sheep 780 rose to 105.2°F., and was 106.4° F. on the following day. It then declined to 105.8° F., and was normal on the sixth day. On the fourth day, that is at the acme of the reaction, 10 c.c. blood were drawn from this ewe and inoculated subcutaneously into a greyface ewe, No. 893. This ewe developed a temperature of 105.6° F. on the fourth day after inoculation. The following day its temperature was 107.6°F., and marked dullness was exhibited. It remained dull the following day, after which the temperature dropped to below 105° F., and the sheep recovered normality. There were no signs of

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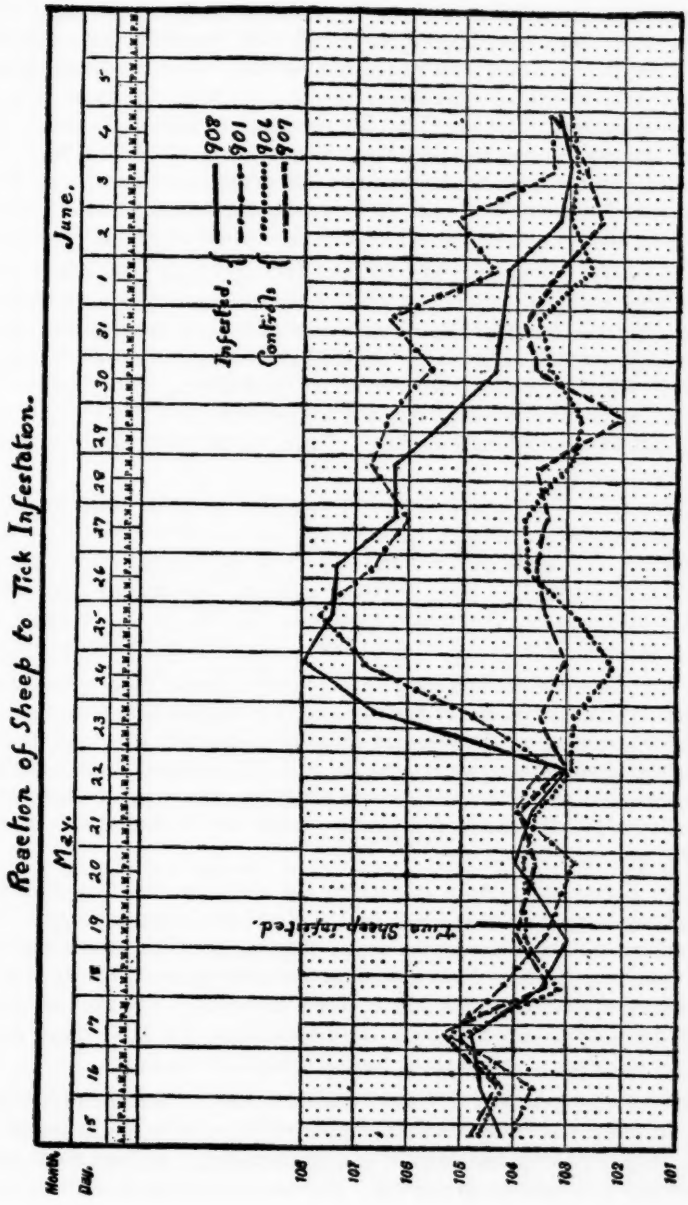
Reaction of Sheep to Tick Infestation.
May.
June.
Month.
Day.
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5
Two Sheep Infested.
Infested. 908 901
Controls 906 907
108 107 106 105 104 103 102 101

locomotor disturbance. Ewes 780 and 893 were tested for immunity to louping-ill by intra-cerebral inoculation of virus eight and three days respectively after recovery. Both sheep died of typical louping-ill. On June 11th, that is nine days after ewe 908 had recovered from its thermal reaction, blood was drawn from it, and 10 c.c. were inoculated subcutaneously into ewe 924. On June 15th, this ewe showed a temperature of 106.8° F. The temperature was 107° F. the following day, then dropped during the next three days through 106.6° F. and 106.2° F. to 105.6° F. By the 20th the temperature had returned to normal. Ewe 908 was tested for immunity to louping-ill by intracerebral inoculation of virus ten days after its temperature had returned to normal. Acute louping-ill developed.

Experiment III. Ewes 909, 931, 933 and 976.—On June 11th, ewe 909 was infested with nymphs which had been collected from louping-ill infected pastures. Another ewe was allowed to run with it as a non-infested control. On June 16th, that is five days after infestation, the temperature of the infested ewe rose to 105.8° F., and reached 107° F. on the following day. The ewe was listless and dull. The following day the temperature was 106.7° F., it then declined and was normal on June 21st. There was no paralysis. The control ewe remained normal.

On June 17th blood was drawn from ewe 909, when its temperature was 107° F. The blood was allowed to coagulate, and the serum inoculated intra-cerebrally into each of the ewes 931 and 933. Ewe 931 developed a temperature reaction six to seven days later, without, however, showing any symptoms of locomotor disturbance. The temperature was 107.2° F. on the seventh day, and then declined to normal four days later. Ewe 933 remained normal.

Ewe 931 was tested for immunity to louping-ill a month later, and died after exhibiting typical symptoms of the disease. On August 4th, forty-four days after the temperature of No. 909 had returned to normal, 10 c.c. of its blood were inoculated subcutaneously into ewe No. 976. On the fourth day after inoculation the temperature of this sheep rose to 107.8° F. For the next three days it remained over 106° F., and then declined through 105° F. and 104° F. to reach normality on the eleventh day.

Control Experiments.—As a control to the above inoculations with blood from reacting sheep, four sheep, Nos. 10, 12, 22 and 915, were employed. These were kept under observation for ten days ; their temperatures were taken daily, and all four were found to have normal temperature curves. No. 12 was then inoculated subcutaneously with 10 c.c. blood drawn from No. 22 ; No. 10 was inoculated subcutaneously with 8 c.c. blood drawn from No. 915. Sheep Nos. 12 and 10 remained normal throughout the following three weeks.

The following experiment serves as a control to the previous infestation experiments. A sheep was infested with nymphs, which as larvæ had engorged on a healthy hedgehog ; they had moulted to nymphs in May. In June, about forty of these nymphs were infested on ewe 907. The ewe remained normal.

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Discussion.

None of the non-infested controls used in the above experiments showed an increase in temperature in any way comparable with the temperature reactions obtained in the experimental sheep. They were subjected to the same degree of handling and to the same environmental conditions. It may be assumed, therefore, that the reactions on the part of the experimental sheep were due to the fact that they were infested with ticks. Apparently, then, ticks obtained from pastures infected with louping-ill can cause a temperature reaction when allowed to feed on healthy sheep. Such a reaction must be due to one of the following causes: (1) an irritant secretion introduced by the tick; (2) the mechanical irritation of tick bites; (3) an infective agent of which the tick is the carrier. The fact that no reaction resulted from a massive infestation with nymphs which had fed as larvæ on a healthy laboratory animal discounts the first two possibilities and suggests that the reaction was due to an infective agent carried by the ticks. This possibility is further strengthened by the fact that the reaction can be transmitted in series to at least two generations by inoculation of blood. The evidence, therefore, indicates that the reaction is due to an infective agent transmitted by the gorging nymphs.

The reaction did not produce in the sheep an immunity to louping-ill when the virus of this disease was inoculated intracerebrally, whereas a reaction caused by louping-ill infection has been shown (Greig, Brownlee, Wilson and Gordon, 1931) definitely to protect the sheep against infection by this route. From this it may be inferred that nymphal ticks collected from certain louping-ill infective pastures may cause in sheep a febrile condition which, on immunological evidence, can be distinguished from louping-ill. If this be so, then much of the confusion in the results of the earlier workers is explained. It is probable that many of the reactions obtained by Stockman as a result of experimental infestation, and assumed by him to be due to louping-ill infection, were in reality due to this febrile condition. Studies of this disease and of the transmission of louping-ill will form the subject of separate communications.

Conclusions.

(1) A temperature reaction occurred in sheep as a result of their infestation by ticks.

(2) This reaction was due, not to the infestation itself, but to an infective agent which these ticks introduced.

(3) The reaction could be transmitted from sheep to sheep in sequence by inoculation of blood.

(4) Blood was infective for sheep when drawn forty-four days after the febrile reaction had subsided.

(5) This tick-borne febrile condition represents a definite pathological entity, the causal agent of which is distinct from the virus of louping-ill.

Acknowledgments.—I wish to express my sincere thanks to Dr. J. Russell Greig, director of the Institute, for his constructive criticism and guidance in the

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conduct of the experiments. Mr. A. Brownlee and Mr. D. R. Wilson, of the research staff, were responsible for the experiments involving surgical manipulation. Mr. A. Linton, of Gilmanscleuch, provided the facilities for the field work.

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BORIC ACID AS A PRESERVATIVE OF MILK SAMPLES FOR ROUTINE BACTERIOLOGICAL EXAMINATION.

By DUDLEY A. GILL, M.R.C.V.S., D.V.S.M.,
Veterinary Laboratory, Wallaceville, N.Z.

ONE feels some diffidence in offering such a small piece of work for publication, but the method appears to be one which will solve a considerable difficulty, and it is hoped that others will test its value. Anyone who has much to do with the bacteriological examination of milk samples in connection with mastitis, etc., will agree that when samples are sent in from a distance, the growth, during transit, of organisms already present in the milk, and of accidental contaminants, often makes it difficult, or impossible, to form any sound opinion as to what comprised the flora of the udders from which they came.

Large numbers of composite milk samples from herds supplying towns with house milk are sent to this laboratory each season from both the North and the South Island for guinea-pig inoculation, to discover cases of tuberculous mastitis. Many arrived in a sour or grossly contaminated condition, making them quite useless, until we adopted the practice of adding 1 per cent. of powdered boric acid to the sample bottles before filling the milk into them—the method suggested by Traum and Hart, *Journal of American Vet. Med. Assoc.*, 1916. Since doing this we have had no further trouble of that sort, and it has saved us a good deal in both time and guinea-pigs.

In the *Journal of Infectious Disease*, Vol. 47, Traum and Henry stated that a similar method was effective in preserving milks that were to be tested by guinea-pig inoculation for the presence of *B. abortus*. Our experience here amply bears

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that out also. As it is intended to investigate the flora of the milk from a large number of cows which have suffered from varying degrees of mastitis (as indicated by the cell content of the milk), it has been necessary to evolve a means by which the organisms present, or contaminants accidentally added, would not multiply during transit to the laboratory. The work of Traum and his colleagues led to a trial of 1 per cent. boric acid for this purpose, and the results, as will be seen from the tables below, have been most satisfactory.

Milk was collected from four quarters of different cows in the laboratory herd, with every possible precaution to avoid contamination. The samples were then shaken and pipetted off in 10 c.c. amounts into sterilised test-tubes, to some of which 100 milligrams of boric acid had been added. The samples were then placed in a refrigerator over-night. On succeeding days, 0.1 c.c. of gravity cream from a "preserved" and "unpreserved" tube of each sample was plated out in duplicate, in poured, ox-blood agar plates (5 per cent. of defibrinated blood, incubation 37° C., plates read at twenty-four and forty-eight hours). After removing from the refrigerator on the morning following collection all samples were left on the laboratory bench at warm summer temperature, but protected from direct sunlight. The results of this trial were as follows:

TABLE I.—MILKS COLLECTED 7.1.32. CONTAMINATIONS AVOIDED.

Quarter.	Date.	1% Boric acid samples.	Unpreserved samples.
Fresia, R. H.	8.1.32	—	30 cocci, 35 streptococci
	9.1.32	35 cocci, 40 streptococci	—
	10.1.32	40 „ 50 „	—
	11.1.32	40 „ 45 „	—
	12.1.32	20 „ 10 „	120 „ 35 „
L2. R.F.	8.1.32	—	135 cocci
	9.1.32	125 cocci	—
	10.1.32	150 „	—
	11.1.32	175 „	—
	12.1.32	140 „	—
Nell, R. H.	8.1.32	—	Sterile
	9.1.32	sterile	—
	10.1.32	1 coccus	—
	11.1.32	1 „	—
	12.1.32	sterile	2 cocci
Daphne, L. H.	8.1.32	—	sterile
	9.1.32	2 cocci	—
	10.1.32	sterile	—
	11.1.32	„	—
	12.1.32	1 coccus	490 cocci

(The streptococci in Fresia's quarter were of the *Str. mastitidis* type, this being a chronically affected quarter. "Cocci" means the common cocci found in the

udder, excluding streptococci. "Colonies" (*see* succeeding tables) comprises mainly cocci as above, but also occasional colonies of aerobic bacilli, diphtheroids, etc. The number of organisms has been obtained by counting each plate to the nearest 10, and averaging the two plates from each sample to the nearest five, except that where the figure was less than 10, the actual number is given.)

In this experiment cultural examination of unpreserved samples was only carried out twice (at the beginning and at the end of the series) as interest at the time was chiefly centred on the preserved samples, the unpreserved merely providing a preliminary basis of comparison. The results appear to show that if the samples are collected with sufficient care, one has a good chance of estimating the flora fairly soundly even after five days, but some samples will give an entirely wrong impression, *e.g.*, Daphne. To discover what one might expect when similar samples were taken by a farmer, the process was repeated, using the same four quarters and the same technique in all particulars, but this time samples were collected in clean, but unsterilised, bottles by the cowman, who was instructed to avoid cleaning the teats, or taking any precautions to avoid other than gross contamination. Table II gives the results:

TABLE II.—MILKS COLLECTED, 18.1.32. CONTAMINATIONS NOT AVOIDED.

Quarter.	Date.	1% Boric acid samples.	Unpreserved samples.
Fresia, R. H.	19.1.32	—	95 cocci, 30 streptococci
	20.1.32	70 cocci, 20 streptococci	30 cocci, *circa* 500 ,,
	21.1.32	40 ,, 7 ,,	Uncountable
	22.1.32	70 ,, 20 ,,	,,
	23.1.32	65 ,, 8 ,,	,,
L2. R. F.	19.1.32	—	100 colonies
	20.1.32	85 colonies	50 ,,
	21.1.32	105 ,,	*circa* 1,000 colonies
	22.1.32	12 ,,	120 colonies
	23.1.32	7 ,,	Uncountable
Nell R. H.	19.1.32	—	10 colonies
	20.1.32	15 colonies	sterile
	21.1.32	1 coccus	Uncountable
	22.1.32	4 ,,	,,
	23.1.32	2 ,,	,,
Daphne L. H.	9.1.32	—	25 colonies
	20.1.32	15 colonies	8 cocci
	21.1.32	6 cocci	20 colonies
	22.1.32	5 ,,	100 ,,
	23.1.32	8 colonies	Uncountable

This table shows very clearly the advantages of the method of preservation.

The evidence of the inherent bacteriostatic action of the milk itself, as shown by the plate counts from the unpreserved samples, struck one as being rather

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unusual, as the samples had only been in the refrigerator for the first sixteen hours, and one would not expect the lag-period induced by refrigeration to hang over for such a long time after the samples were restored to room temperature. However, my colleague here, Mr. G. V. Morgan, N.D.A., informed me that he had frequently noticed an abnormally long lag-period under such circumstances; and in view of this, and the fact that the samples sent in by farmers would not be placed on ice before posting, it was decided to run a third test in which the technique would be identical except that the samples were held at room temperature from the time of collection. In this series there were again no precautions taken to avoid other than gross contamination. The results were:

TABLE III.—MILKS COLLECTED 26.1.32. CONTAMINATIONS NOT AVOIDED.

Quarter.	Date.	1% Boric Acid Samples.	Unpreserved Samples.
Fresia R. H.	27.1.32	15 cocci, 75 streptococci	50 cols., *circa* 1,000 strepto.
	28.1.32	35 colonies, 125 ,,	Uncountable
	29.1.32	40 ,, 85 ,,	,,
	30.1.32	40 ,, 80 ,,	,,
	31.1.32	20 ,, 25 ,,	,,
Ayrshire R. F.	27.1.32	150 colonies	310 colonies
	28.1.32	125 ,,	*circa* 800 colonies
	29.1.32	140 ,,	*circa* 2,000 colonies
	30.1.32	160 ,,	Uncountable
	31.1.32	55 ,,	,,
Nell R. H.	27.1.32	50 colonies	Uncountable
	28.1.32	40 ,,	,,
	29.1.32	15 ,,	,,
	30.1.32	115 ,,	,,
	31.1.32	45 ,,	,,
Daphne, L.H.	27.1.32	1 coccus	1 coccus
	28.1.32	sterile	*circa* 1,000 colonies
	29.1.32	,,	520 colonies
	30.1.32	,,	Uncountable
	31.1.32	4 cocci	,,

Ayrshire was included in this group in place of L2 who had been dried off. The results are even more clear-cut than in Table II.

In order to make use of such a method as this in dealing with large numbers of samples, it is obviously desirable to have a quick and easy method of adding the requisite quantity of boric acid to the sample bottles. A good deal of time would be absorbed in weighing out amounts equal to 1 per cent. for each sample, and it was felt that probably one could use considerably more, or less, boric acid without affecting the results. To test this latter point as a preliminary, the following experiment was conducted: A sample was collected, without precautions to avoid contaminations, in a clean but unsterilised flask from Fresia R. H.

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It was then pipetted off in 10 c.c. amounts into a series of sterile test-tubes containing 0 per cent., 0.5 per cent., 1 per cent., and 1.5 per cent. boric acid; the tubes were kept at room temperatures, and one of each was plated out on successive days, using the same technique as above. The sample was collected on 7.2.32, and plating out commenced the following day. Results are shown in the next table.

TABLE IV.—EFFECT OF BORIC ACID IN DIFFERENT CONCENTRATIONS.

8.2.32	Unpreserved	50 colonies, *circa*	2,000 streptococci
	0.5 %boric acid... ...	30 ,,	85 ,,
	1% ,, ,, ...	20 ,,	80 ,,
	1.5% ,, ,, ...	35 ,,	75 ,,
9.2.32	Unpreserved	Uncountable	Uncountable
	0.5% boric acid... ...	15 colonies	65 streptococci
	1% ,, ,, ...	40 ,,	100 ,,
	1.5% ,, ,, ...	30 ,,	150 ,,
10.2.32	Unpreserved	Uncountable	Uncountable
	0.5% boric acid... ...	250 colonies	75 streptococci
	1% ,, ,, ...	20 ,,	115 ,,
	1.5 % ,, ,, ...	25 ,,	100 ,,
11.2.32	Unpreserved	Uncountable	Uncountable
	0.5% boric acid ...	15 colonies	95 streptococci
	1% ,, ,, ...	30 ,,	80 ,,
	1.5% ,, ,, ...	25 ,,	135 ,,
12.2.32	Unpreserved	Uncountable	Uncountable
	0.5% boric acid... ...	25 colonies	40 streptococci
	1% ,, ,, ...	25 ,,	60 ,,
	1.5% ,, ,, ...	30 ,,	100 ,,

It is apparent from this that no great accuracy is needed.

Ordinary cylindrical one-ounce bottles are generally used here for collecting samples of this sort, and it was found that the average capacity of fifty of these, when filled " up to the shoulder," was 27.9 c.c.—the smallest held 27 c.c., and the largest 28.5 c.c. A small metal spoon, hemispherical in shape, 14 mm. in diameter and 7.5 mm. in internal depth, was used as a measure for the boric acid. When the spoon was filled with the powder, and any excess scraped off by drawing a straight-edge across the spoon's rim, it was found to hold an average of 359 milligrams. Of ten such amounts that were weighed, the lowest was 355 mgrms., and the highest 380 mgrms. Thus, on these figures, one might collect a sample of 27 c.c. of milk in a bottle containing 380 mgrms. boric acid, giving a concentration of 1.4 per cent., or 28.5 c.c. of milk in one containing only 335 mgrms., a concentration of 1.17 per cent. But, as is shown in Table IV, these concentrations are quite satisfactory, so that one-ounce sample bottles may be quickly prepared by using a spoon of these dimensions as a measure for the preservative. As

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a final test of the method, and to simulate the conditions under which samples would be sent in from the field, milk was again collected from Fresia R. H., and this time was poured into one-ounce bottles prepared in the above manner. A portion without any preservative was immediately placed in the refrigerator. Preserved samples were posted to Auckland, Christchurch and Dunedin, with a request that they be posted back again by return mail, and others were retained in the laboratory. The original sample was collected on 16.2.32, and results of this test were as follows:

TABLE V.

16.2.32	Unpreserved sample six hours in refrigerator	50 cols.	170	streptococci
17.2.32	Preserved sample 24 hours room temperature	55 „	150	„
19.2.32	Preserved sample returned from Christchurch	35 „	115	„
19.2.32	„ „ „ „ Auckland	25 „	125	„
22.2.32	„ „ „ „ Dunedin	30 „	100	„
22.2.32	Preserved sample standing at room temperature in laboratory since 16.2.32	75 „	80	„

Bottles with boric acid added that are sent out from a laboratory for the collection of milk samples should be sterilised, and—an important point—fitted with sterile rubber corks. If ordinary corks are used it may be that they are far from sterile, and large numbers of contaminating organisms may be washed out of them by constant flushing and soaking with the milk during transit. Even if such organisms are prevented from growing by the preservative, they may be present in the sample in large enough numbers to vitiate the results of cultural examination.

Conclusion.—When approximately 1 per cent. boric acid is added to a sample of milk at the time it is drawn, one can obtain a fair idea of the original flora even after a lapse of five days at summer temperatures. The flora by that time may have fallen off somewhat numerically, but will still be representative of what was present in the bottle immediately after the sample was drawn. Contaminants will be present, if precautions are not taken to preclude them, but since they do not multiply they are not of much consequence so long as reasonable cleanliness is observed at the time of sampling.

VITAMIN B AND FOWL PARALYSIS.

By W. P. BLOUNT, F.R.C.V.S.

Poultry Pathological Research Laboratory, Goring-on-Thames.

THE toll which fowl paralysis exacted last year amongst poultry was very great, it having been stated in the press that one county alone lost over twenty thousand birds, and from the number of cases which are occurring daily it is evident that this disease is by no means under control. The experiments of Warwick and Dalling in England, and those of Pappenheimer, Dunn, and Seidlin in America, suggest that fowl paralysis is caused by a virus, the ravages of which are reflected in the body tissues in the form of semi-organised deposits of mono-

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nuclear cells, hence the term lymphomotosis (Dalling) ; or neuro-lymphomotosis gallinarum (Pappenheimer), since the major sign is that of nerve infiltration by lymphocyte-like cells. Unfortunately, however, other laboratory workers in this country and abroad, adopting similar experimental methods, have failed to achieve results which allow of the conclusion that a virus is to be considered the ætiological factor.

Following Dalling's original announcement in *Eggs*, August 19th, 1931, that he had succeeded in transmitting the disease to healthy birds by inoculation (after an incubation period of at least two months) this laboratory initiated inoculation experiments, but so far none of these have succeeded even after an incubation period of six months. It is possible that some of the original birds which we injected with an emulsion of diseased nerves were too old to contract fowl paralysis—their average age being six months. However, since that time (November, 1931) we have used birds varying from six weeks to four months of age ; these have been injected intramuscularly with various tissues : kidney, spleen, nerves, or whole blood, ground up and emulsified in normal saline solution. Three birds only have exhibited signs of paralysis ; after a time these were killed, but in no case were the post-mortem or histological appearances characteristic of lymphomatosis. At the present time about twenty birds are under such experimentation, but no evidence has been acquired which supports the virus theory. It is understood that another laboratory conducted similar injection experiments which gave negative results, but it is not impossible that the incubation period allowed was too short for the disease to develop. Such failures do not, of course, suggest that the virus theory is untenable, because it is well known how extremely unstable a virus may be, and it is quite possible that the methods used by unsuccessful workers were such that the virus was rendered inactive. In our own case, tissues were taken whilst the affected animals were still warm, the grinding process was reduced to a minimum, and from 1 to 2 c.c. were injected intramuscularly. The emulsions were not filtered or centrifugalised, but lumps of material incapable of passing through a fine bore hypodermic needle were, of course, not inoculated, so that actual " mass transplantation " was not effected or attempted.

If the virus theory is accepted, and in view of the fact that evidence from the field strongly supports this possibility—it having been shown that in birds on one poultry farm, bred, housed, handled, and fed identically as far as is practicable, fowl paralysis may develop in one strain and not in another—this suggests that the disease is not contagious or infectious in the usually accepted sense of these terms, and also that either the disease factor, or a susceptibility to it, is inherited. However, what is of greatest interest is the fact that the experiments of Dalling and Pappenheimer were never more than 25 per cent. successful. This again is probably not sufficiently serious to depress those supporters of the virus origin of fowl paralysis, but it obviously requires a definite explanation. If it is presumed that the technique adopted was standardised, it follows that (1) either all birds

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are not susceptible to the virus, or (2) secondary factors are necessary to develop the disease process.

There is a strong probability that individual birds may be completely resistant to lymphomatous inoculations, because Gye and Purdy (1931) found birds which were immune to injections of Rous sarcoma filtrates, and presumably such an active virus is more likely to be effective than that of a lymphoma. Indeed, certain Canadian workers, Asmundson and Beily (1932) state: " these results therefore point to inherent differences as an important factor in resistance to paralysis," and also, " there appears to be a difference in susceptibility to paralysis among the progeny of different families," which indicates that fowl paralysis may be developed only in certain strains of birds.

A brief review of certain workers' experimental results will show the importance of factors additional, or antagonistic, to the causal virus. Siefried (1929) claims to have been successful in five out of five hens *fed*, but in three only out of fifty-one birds *injected* with fowl paralysis material. Pappenheimer and his colleagues were more successful in that twenty-four definitely positive results accrued from eighty-seven inoculated birds; but in another sense they failed because approximately 7 per cent. of their controls developed the characteristic paralysis, which rather suggests that their strain of birds was not free from the disease before such experiments were commenced. Their statement that " we feel justified therefore in drawing the conclusion that the inoculation of material from paralysed fowls definitely favoured the subsequent development of the disease" is interesting, even if only because of the absence of any reference to a virus. Dalling injected three adult birds with spleen emulsion; result, all negative. Four adults injected lung tissue; result, one success. Nine adults injected intracranially with brain emulsion; result, all negative. Six adults adults injected spleen and lung emulsion from the above-mentioned successful experiment; result, one positive after six months. Using seventy young birds, aged eight to ten weeks, the following results were obtained: Spleen, 14 birds; result, three successes. Lungs, 12 birds; result, one success. Brain, 23 birds; all negative. Peripheral nerves, 21 birds; result, one success; making a total of seven positive results in ninety-two inoculation experiments. It can be seen therefore that Warwick and Dalling only achieved definite success in less than 8 per cent. (1 : 13) of their cases; and in view of the fact that there were at the end of the experiment only eighteen controls, it is possible (though not necessarily probable) that an odd case might have developed spontaneously had more " controls " been available. No one will question the solidity and value of their work, but in achieving a bare 8 per cent. success, with a loss of 83 per cent. of their inoculated, and 34 per cent. of their uninoculated control birds (up to the age of eleven and a-half months), Warwick and Dalling have not made the question of a virus origin of fowl paralysis impregnable. Incidentally, it should be noted that chicks hatched by Dalling and Warwick from eggs laid by heavily infected stock only developed the disease in about 5 per cent. of cases. Even in birds which are

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susceptible to the disease it is highly probable that secondary precipitating or developing factors are necessary, since it may be observed in natural outbreaks of the disease that symptoms are shown by some animals at the age of ten to twelve weeks, whilst other members of the same flock develop the disease several weeks or months later. If there are any special antibodies against fowl paralysis, then the more a bird possesses presumably the longer will be the delay in the onset of its clinical manifestations; but, in addition, there would appear to be certain indefinite factors which stimulate the disease processes.

In other articles (Blount, 1932, and Hamilton and Blount, 1932) these factors have been dealt with under three heads: (1) parasites, (2) general management, (3) nutritional. It is this last group the writer wishes to discuss, particularly with reference to vitamin B.

It has been shown that typical cases of fowl paralysis can develop without the association of an intestinal parasitosis, although in the writer's experience parasites of the small intestines or cæcæ are present in the majority of cases. It should be pointed out that originally it was believed that in birds which were susceptible to fowl paralysis (through the presumed inheritance of the causal factor in a latent form), the symptoms of the disease proper were initiated and precipitated by such parasites; but careful dissection has shown that an accompanying enlargement of the abdominal sympathetic nerves is present in most cases. It seems possible, therefore, that a primary infiltration of the autonomic nervous system causes intestinal derangement, which reduces resistance, and is followed by parasitism, thereby setting up a vicious circle. However, the degree of nerve enlargement in cases of neuro-lymphomatosis is not dependent upon the severity of any such intestinal parasitosis, and some other factor must be looked for in this respect. Probably the best example of a rapidly forming lymphoma is that seen in a typical " fowl paralysis " ovarian tumour. A possible stimulation is due to the fact that the ovary normally shows rapid increase in size, due to its physiological functions, but large ovarian tumours composed of mononuclear infiltrations may be seen in birds aged ten to twelve weeks, at which period there is no marked physiological ovarian activity. What therefore is the specific factor which has developed so forcibly a large ovarian lymphoma in a young pullet? A careful survey of all available possibilities combined with a knowledge of modern poultry husbandry reveals the fact that the necessary stimulation is in all probability related to nutrition. The present-day tendency on the majority of poultry farms is to defy nature by one of two methods: (*a*) by creating nutritional deficiences; (*b*) by using " forcing " foods, associated with an excess of one or several food factors.

Bayon (1931–32) has dealt adequately with the question of lack of suitable *fresh* green food for poultry, particularly during the growing period, and the writer has stressed the necessity for endeavouring to supply intensively reared stock with other forms of " living " foods, particularly in the supply of animal proteins. Also the fact that certain digestive bacteria are less available for

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birds kept away from the ground compared with naturally reared stock, and it has been emphasised, too, that birds at all ages should receive a supply of insoluble grit, since many poultry keepers have failed to realise that lime-containing grits disappear from the gizzard during digestion, and are therefore no longer available for grinding purposes. It is, however, the modern tendency to use forcing mashes which grow big chicks in a short time which it is necessary to criticise severely. The average layman is incapable of realising that his biggest chicks are not necessarily his best or strongest where disease-resistance powers are concerned. Time after time in outbreaks of disease in poultry (particularly in coccidiosis) it is reported by the poultry keeper that the biggest chicks are attacked first, and from a knowledge of the principles of veterinary dietetics it is not unreasonable to conclude that such abnormal chicks have outgrown their disease-resisting powers.

It is easy to recall that one of the features of " blackleg " in calves is that the largest and apparently most healthy calves suffer first ; is it not possible that the same explanation holds good here ? In the same way that poultry keepers are using rich stimulating diets for their chicks, so dairy farmers are feeding richer concentrates to their young growing stock, and consequently their fundamental powers of vitality fail to develop. Too large a creature is formed in so short a time that external size is gained at the expense of internal disease resistance. Poultry keepers usually provide mashes for their chicks which contain all the essential food constituents, but by degree such mashes have become more and more abnormal, containing carbonaceous or nitrogenous foods in excess. Such combinations are, from a nutritional aspect, definitely harmful, because they produce large chicks at a very early age, and egg production commences at about the fifth month, instead of several months later, as would occur under normal circumstances or with less forcing rations. The three chief factors which are often present in excess are maize, bran, or certain protein-rich foods. It is well known that an increase in the protein content of a ration brings about rapid growth and early maturity in young growing animals, and to illustrate the extent to which some poultrymen have gone, in order to achieve commercial advantages, it is proposed to append two rations.

TABLE I.

(A) A Poultry Society's Battery Brooder Mash.	lb.	(B) A well-known farmer's Special Forcing Battery Mash.	lb.
Middlings	45	Middlings	16½
Bran	20	Bran	11
Maize germ meal	10	Maize meal...	33
Sussex ground oats	10	Sussex ground oats ...	11
Dried yeast	5	Dried yeast	5
Soya bean meal	5	Soya bean meal	0
Dried milk	5	Dried milk	5
Meat meal	0	Meat meal	11
Alfalfa	0	Alfalfa	7½
Charcoal	0	Charcoal	2%
	100		100

It has been realised by poultry keepers that to give whole grain to chicks wastes time during digestion, and therefore an all-mash system of feeding has been propounded, and is in vogue on many farms. Chicks are nowadays kept indoors for the first eight weeks of their lives in brooding houses (temperature about 68° F.) with mash hoppers all around them. This tends to avoid coccidiosis, and it prevents loss of energy through excess scratching ; and in order to stimulate growth as much as possible, from 10 to 30 per cent. of protein-rich foods are included in the mash. It is not difficult to understand why such concentrated materials lead to a certain amount of intestinal fermentation, hence the necessity of charcoal (*see* mash B). It is not generally appreciated, however, that charcoal adsorbs not only harmful gases, but ferments, vitamins, and " digestive bacteria," which are all of benefit to the chicks. From a commercial aspect, such methods are excellent, because they foster the production of chicks which appear definitely large and advanced for their age, and egg production commences at a very early stage. As these birds are seldom kept for more than two years, such " early production " does not necessarily undermine their constitutions, as would occur where eggs are expected for several more years ; it is significant, however, that losses amongst such birds are heavy, particularly those associated with ovarian and oviduct ailments.

From a health standpoint, however, forcing methods are fraught with danger, and it is not improbable that the more recent manifestations of fowl paralysis are in the main due to nutritional factors which have stimulated the primary causal factor to operate on a widespread scale. In this connection it would appear logical to conclude that because tumour cells require a certain quantity and quality of amino acids for their formation, the best method of assisting tumour cell multiplication in susceptible subjects is to offer a variety of proteins, and in supplying those of both vegetable (oats, wheat, beans, etc.) and animal origin (meat meal, fish meal, whale meal, and milk) in high percentage, the poultry farmer is presenting the primary tumour cells with as " stimulating " material as possible. It is therefore suggested that present-day poultry keepers, by feeding protein-rich mashes, are fostering disease processes, particularly those associated with cell development.

In order to supply the necessary proteins for growth and egg production, it is customary to include soya bean meal, meat meal, etc., which may be considered reasonably normal, since legumes and flesh are often available for birds ; but it would appear less logical to offer fish meal or whale meal, and certainly rather irrational to add milk products. Admittedly from such a variety of proteins it would be a comparatively easy matter for a chick to " select " its necessary quota of amino acids, but is there not the possibility that other amino acids definitely foreign to *Aves* may cause trouble, particularly where neoplastic " nests " lie dormant ? The introduction on a large scale of dried milk products for poultry has been effected only quite recently, and may perhaps have a bearing on a limited aspect of avian pathology. It is known that biological cells multiply not when

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nitrogenous food material alone is available, but only when additional stimuli are also present. Recent work on vitamins has shown that several of these are growth-promoting; the original water-soluble vitamin B is now believed to consist of several complex factors, and some of these are cell stimulants in action.

In 1926, Goldberger showed that vitamin B consisted of two factors: (1) anti-neuritic (B1); and the other (2) anti-pellagric (B2); but since that time Reader has shown the presence of a third factor, probably necessary for pigeons (B3), whilst Williams and Waterman (1928) have isolated another substance necessary for adult pigeons, but not for growing rats (? B4). It is this first factor (B1) which is under discussion in this paper.

The general nature of fowl paralysis indicated that this disease might be related to nutritional defects, and thoughts were at once directed towards vitamin B, since a deficiency of this is known to be associated with nervous symptoms in birds; but it was soon made clear that fowl paralysis could not be directly allied to this condition, both from clinical and pathological standpoints. It is, however, interesting to compare the two diseases, because there are several points in common.

TABLE II.

Organ or Symptom.	Advanced Polyneuritis in Pigeons.	Advanced Fowl Paralysis in Pullets.
Spleen	Atrophied	Atrophied
Liver	Slight atrophy	Marked atrophy (probably congenital)
Gall-bladder ...	Full	Full
Heart	Atrophy	Atrophy common
Pancreas	Marked atrophy	Normal
Duodenum ...	Hyperæmic with ecchymoses	Frequently inflamed
Ovary	Marked atrophy	Marked inactivity
Subcutaneous tissues	Complete disappearance of fat	Complete disappearance of fat
Ascutes	Rare	Rare
Hydrothorax ...	Rare	Absent
Hydropericardium	13 to 75 per cent.	Rare
Muscles	Great atrophy, often pale or mottled	Affected leg muscles show great atrophy, other muscles often atrophied
Vessels	Abdominal vessels often congested	Normal
Adrenals	Enlarged and friable... ...	Sometimes enlarged, generally friable
Dysphagia ...	Common	Absent
Air hunger ...	Sometimes exhibited... ...	Fairly common

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Both diseases may be characterised by a peripheral paralysis, but that of beri-beri is combined with enlargement of the heart and œdema, neither of which states are present in fowl paralysis; but avian polyneuritis, which, like beri-beri, is due to a deficiency of vitamin B, rarely demonstrates these latter conditions, in such respects differing from the similar disease in man. Polyneuritis shows a commencing paralysis of the flexor muscles of the toes, wing drop is rare, and dysphagia occurs in the later stages. In fowl paralysis the extensor muscles of the toes are commonly attacked, wing drop is common, and there is no difficulty in swallowing. The gall bladder is usually full, in contrast to that of acute uncomplicated polyneuritis. From the above table it can be seen that there are certain signs which are common to the two diseases, but whilst a deficiency in vitamin B causes degeneration in the myelin sheaths of the sciatic nerve fibres, the pathology of the nerves in fowl paralysis is quite different, degeneration being associated with mononuclear cell infiltration. Whilst the majority of the lesions occur in the nerves immediately after they have left the spinal cord in fowl paralysis, Honda (1914) and others have shown that the greatest changes in polyneuritis occur near the nerve *endings*, and become rapidly less as the nerves approach the spinal cord.

It is probable, however, that the symptoms common to both diseases are due to the same factor, namely, inanition. Lasowsky and Sumnitsky (1926) have shown that enlargement of the adrenal cortex (with friability) occurs in conditions where a rise in the fat content of the blood is seen, such as in pregnancy, castration, and hunger.

Findlay (1921) has shown that although cases of avian polyneuritis do not show a full gall baldder, this frequently occurs in chronic cases due to the accompanying inanition; and in chronic cases of fowl paralysis, starvation is also common. Similarly with the generalised internal atrophy noted, particularly of the spleen, although there can be no confusion between the two diseases, certain facts suggest that vitamin B may be related to the establishment of fowl paralysis. It has been customary until quite recently to consider vitamins in the light of "deficiency" diseases, but it is now known that an excess of such accessory food factors can be associated with pathological conditions, and, further, that definite relationships exist between individual vitamins, and if these are broken disease may again be favoured.

Browning (1931) states that an imbalance of vitamins may have definitely toxic effects, just as surely as a partial deficiency of all or a complete absence of one; and Grant (1926) has shown that severe disturbance between vitamins C and D decreased the normal resistance of the intestines to ærtrycke infection. The same author showed (1930) that tuberculosis cannot be cured unless vitamin C is present, and that a prolonged excess of vitamin D over two or three generations, with a normal or deficient supply of calcium, hastened the spread of tuberculosis throughout the lungs. Recently Innis (1931) demonstrated that an excess of

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vitamin D caused an abnormal deposition of calcium salts in the tissues. This is interesting, because from this result, and from the fact that a deficiency of vitamin D prevents proper calcification, it would seem that vitamin action is progressive in relation to certain substances or states, increasing with the amount present. If such is the case, then we have in Vitamin B a potent factor associated with the development of fowl paralysis. Thus: Vitamin D deficiency=rachitis; small quantities of vitamin D present in the diet=normal calcification; excess vitamin D in the diet=hypercalcification; complete lack of vitamin B1=lymphopenia—tumours fail to grow; reasonable supply of vitamin B1=recovery from lymphopenia—tumours grow; Hypervitaminosis B1=(?) lymphomatosis (fowl paralysis).

Crammer (1920) states that an absence of vitamin B causes atrophy of the lymphoid tissues with lymphopenia. Browning states that there is evidence that the organism recovers more rapidly from a lymphopenia (induced by radiation) when an abundant supply of vitamin B is administered. In vitamin B deficiency of pigeons lymphopenia exists (Nagayo, 1923); Crammer, Drew, and Mottram (1921) go so far as to say that atrophy of the lymphoid tissues is a constant and essential result of vitamin B deficiency. In view of the work of Innis and others on hypervitaminosis D, is it unreasonable to expect that hypervitaminosis B stimulates the lymphoid system? Further, Burrows, Jorstad, and Ernst (1926) have suggested that a tissue imbalance of A and B is present in cancerous tissues. Funk (1914) suggested that cancer was probably dietetic in origin. He found if vitamin B was absent or deficient, a growth of Rous sarcoma tumour slackens and grafts are not successful. Later, in 1919, Funk isolated a substance (B1) from insulin, and this stimulated the growth of tumours. He believed this factor is found in all flesh foods. Erdman and Haagen (1928) found a greater occurrence of tumours in rats with excess vitamin B. Taniguchi (1928) found that transplanted sarcoma in hens shows least growth on vitamin B deficient diet, but on a vitamin B rich diet the tumours penetrated irregularly into the tissues. There was a distinct difference in the histological picture of the cells from both groups after six days. Heyman and Gallinek (1928) found that about 56 per cent. of tumour inoculations "took" in rats on a vitamin deficient diet, and 80 per cent. on a normal diet. On a normal diet the tumours reached 77 per cent. of the body weight in thirty days, whereas only 9 per cent. of those on a deficient diet reached over 13 per cent. of the body weight. In normally fed rats the tumours weighed 3.8 times as heavy as those from animals fed on deficient diet.

Realising that fowl paralysis is a neoplastic process associated with lymphocyte-like cell infiltration, and from the above evidence, it would not appear unreasonable to conclude that a diet rich in vitamin B will favour the progress of such tumours, especially as poultry keepers are known to be feeding an excess of this vitamin. It is common knowledge that some cereal products and other food substances fed to poultry are rich in vitamin B1, but for those less familiar with its distribution, the following tables are appended:

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TABLE III.

The Vitamin B1 Content of Common Foodstuffs.

After Plimmer and Rosedale (1927).		After Browning (1931).	
Dried yeast	100	Yeast	+++
Wheat germ	66	Egg yolk...	++
Marmite	45	Dried whole milk ...	++
Bakers' yeast	40	Barley	++
Bran	13	Maize germ	++
Soya beans	13	Wheat germ	++
Middlings	12	Soya beans	++
Whole wheat	9	Cabbage	++
Barley	8	Chicken liver	+
Maize	8	Dried skim milk... ...	+
Oats	5	Yellow maize	+
		Oats	+
		Alfalfa	+
		Clover	+

According to Plimmer, man requires 3 per cent. and birds 6 per cent. of vitamin B1 in their diet, but calculating from the rations previously quoted (Table I), it can be seen that a large excess of vitamin B is being fed.

Vitamin B1 Content.—Ration A, 17 per cent.; ration B, 12.6 per cent.; ration H, 8.5 per cent.

In comparison with ration H, advocated by Halnan (1930), it will be seen that the one formulated by the Poultry Society (A) contains 100 per cent. more vitamin B1. This is instructive, but more particularly so when it is realised that this society advocates that no fresh green food is necessary for health of poultry. If there is any foundation for the belief that an imbalance of vitamins can cause harm, then to give an excess of vitamin B1 to growing chicks, and at the same time to deprive them of their chief supply of vitamin C, is to produce such an imbalance, and it is suggested that this may be related to the prevalence of fowl paralysis. If it be realised that poultry are largely fed on cereal by-products which have a *concentrated* content of vitamin B1 because of the effects of milling, namely, the removal of flour from wheat, then it will be understood why most commercial poultry are really suffering from hypervitaminosis B1, more especially since the introduction and adoption for growing chicks of yeast, which supplies an additional rich source of this vitamin.

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HISTOLOGICAL EVOLUTION AND PHYSIOLOGICAL MANIFESTATIONS OF GLANDULAR GRAFTS.*

By SERGE VORONOFF.

Director the Laboratory of Experimental Surgery, Collège de France.

AN experience of twelve years with glandular grafting done upon man and animals, and the observation of a considerable number of positive and some negative results, permit this question to be examined in all its aspects, both physiologically and from the viewpoint of the histological changes and evolution occurring in the grafted tissues. From the purely histological viewpoint, Professor Retterer has reported a large number of positive results. You doubtless recall one of the most characteristic cases, presented on December 15th, 1919. Preliminary examination of the grafts showed that they belonged to a young ram, in the pre-puberal period, whose testicles presented the stage just preceding spermatogenesis. They were removed from an old ram, fourteen months after being grafted into this animal, and were found to be filled with spermatids and spermatozoa. Not only were these grafts neither necrosed nor resorbed after remaining for fourteen months in the older animal, but they had continued their regular evolution in their new environment. Retterer has observed surviving epithelial cells in grafts two years old.

Through the kindness of some of our human patients, especially in the case of physicians, we have been enabled to remove simian grafts after periods of two and one-half years, three years and two months, four and one-half years, and quite recently, after a period of six years. Sections of a graft of two and one-half years, when examined by Retterer, shows the presence of a large number of

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distinctly glandular epithelial cells. Some of the tubules present have a central lumen. Here is a simian graft removed three years and two months after grafting. The sections were made by Dr. Alexandrescu, at the laboratory of the Collège de France. This graft has an abundant vascular supply. The most characteristic feature of this graft consists in the presence of spermatozoal heads in the central parts of the tubules. Another remarkable fact is the presence of a sensory Pacini-Vater corpuscle in the peripheral part of the graft, a condition which explains the sensitiveness of such grafts, often very great, to palpation when practiced upon grafted men. Here, finally, is a simian graft removed after a period of four and one-half years after being implanted in man. The graft and the host tissues are inseparably adherent and united. Rather numerous and well-developed vessels exist, while epithelial elements grouped in islands are limited in number. Connective tissue clearly predominates. The graft has evolved toward a sclerotic transformation, though still retaining a few glandular elements. We desire to call attention particularly to the presence in all these grafts of many newly-formed vessels produced following the previous scarification of the tunica vaginalis, a procedure which is essential in our method, and necessary for securing survival of the glandular elements by means of free irrigation with blood.

Grafts six years old, whose description by Retterer may be found in the *Annales d'Anatomie Pathologique* (*Annals of Pathological Anatomy*) in a recent issue, have preserved their form and dimensions, not having been resorbed. In the well-nourished peripheral portion there are an epithelial layer and also some young reticulated connective tissue, while in the central parts of the grafts the seminal tubules, or columns, are poorly nourished, and have regressed to fatty degeneration of the contents of the seminal tubules. From this rapid review of the histological evolution of testicular grafts when transplanted according to our technique, we may conclude as follows: In some cases the grafts undergo necrosis, or are rapidly resorbed, on account of certain unfavourable biological conditions. In a considerable number of cases, however, survival of the grafts has been proved either by direct histological examination, or by the persistence during a number of years of objective physiological manifestations depending directly upon the testicular hormone secreted by the grafts.

In Algeria you have yourselves been able to note effects of the graft persisting for years. Many of your veterinaries have known about the famous bull, " Jacky," confided to us for treatment by our friend Mr. Nouvion, in 1924. It is not yourselves who will question the transformation of that miserable old animal into a magnificent bull. We recall the facts for those of you who have not seen this animal. In 1924, " Jacky," owned by the Algerian Agricultural Society, directed by Mr. Nouvion, was seventeen years old, and had been absolutely unfit for breeding purposes for two years. We visited the farm of Bou Chellel, near Blida, and observed that Jacky's condition was really lamentable in every respect. He was very thin, his hair was dull and his eye lifeless, in a head showing every sign of old age. He kept apart from the herd, and the females

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had no interest for him. Here is a photograph (*Plate I*) of him taken at this moment. On March 5th, 1924, we grafted him, using the testicle of a native bull two years old. Drs. Barillon and Puelma, and the veterinaries Schmidt, Pons, Bosselut,Wagner, and Barlette supplied valuable assistance.

On March 20th, 1925, we received the following letter from Mr. Nouvion, which we give *verbatim*: " In a previous letter I have told you of the prowess of the bull " Jacky," which you grafted last year at about this time. At the moment when you operated his breeding career was completely over, and I was on the point of selling him for butchering. Three months after the operation, during the month of May, 1924, " Jacky " resumed his breeding functions, and has scarcely interrupted them since then, and only in the absence of the females. Of the cows with which he coupled very soon after being grafted, three have recently produced offspring. Of the calves, two have all the characteristics of his race, and the third is clearly his. In order to show you exactly how he behaves, I give you notes taken from the records of all the couplings occurring at the farm since last January. (These records show that " Jacky " was coupled with several cows.) He is in excellent condition, his hair is shiny, and his eye bright and keen. He is very vigorous, and when he is fenced in he leaps over very high barriers to join the herd."

We saw him for the first time since the grafting on the following April 8th. We were accompanied by Generals Boichut and Gratier, by the Prefect of Algiers, M. Alliez, by M. Trouette, the inspector of animal rearing, and by many veterinaries and colonists. We found " Jacky " radically transformed. He had regained his former vigour, and all his sexual fire. After one year, not only was the beneficial action of the graft intact, but it appeared to have increased with time. We saw " Jacky " again in April, 1927, three years after the grafting. We found his aspect very fine. He was strong and vigorous, with well-developed muscles, shining hair, and rather ill-tempered. Here is a photograph of him, aged twenty years (*Plate I*). We were satisfied with this durable result; but we observed a discussion between Mr. Nouvion and his chief Arab herdsman. The latter declared that not only was " Jacky " remaining a fine bull, in place of his former miserable self, but that he was continuing his breeding duties. Mr. Nouvion, on the contrary, maintained that " Jacky " retained his fine appearance, but that he could not accomplish the great effort required for the act of fecundation. In view of the existing doubt, and to please our friend, we remarked that a fresh graft could only be very beneficial for " Jacky," and still further increase his sexual capacity. We therefore regrafted him on April 8th, 1927, aided by our two laboratory assistants, Didry and Petinary, who made the trip with us. Since then we have continued to receive excellent news about " Jacky." Mr. Nouvion has stated that " Jacky " retained all his recovered powers for two years more. The grafts have thus been active for five years, and " Jacky " has been able to continue his breeding functions to the age of twenty-two. According to the scale of the duration of human life, the life of " Jacky " is equivalent to the human span of 90 to 100 years.

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Mr. Bigot, a veterinary in the cattle-raising service at Casablanca, and just now in France, has presented us with two cases of grafting, equally characteristic, performed by himself and Mr. Velu in Morocco. We give his report quite literally

"*Graft on an Ass.*—The animal was imported into Morocco from France. It was very old, being aged eighteen to twenty years, could stand with great difficulty, and presented all the characters of old age. On arriving in Morocco he proved to be frigid, cases of this kind being not rare. He never did anything in breeding, and was hardly ever used. Since he was of no utility, his colonial proprietor was ready to devote him to scientific experiment. He was therefore grafted. During the days following the operation, his extreme weakness, sores caused by pressure, and the operative shock, caused fear not only for the success of the operation, but that death might occur. One one side, but only on one side, the grafts suppurated, and were eliminated. The animal finally recovered, and was sent back to its owner. For some time it was lost sight of, but some ten months later the proprietor was seen, and was asked about his grafted donkey. To our great astonishment we learned that the ass had recovered great vigour, and that it was in excellent health. The formerly dying animal, it appeared, had been harnessed to a cart and had run away. He is hard to hold, rushes away with what he is harnessed to, and presents a complete transformation. The owner cannot say whether he has regained sexual power. At all events the animal had never manifested breeding capacity since he was imported."

"*Graft of an Indian Bull.*—An Indian bull, owned by the cattle-raising service at Casablanca, was very old, had ceased all breeding, and appeared to have lost all its value. It was regrettable, for present sanitary regulations prevent the importation of these animals from India, and their price is very high. The animal was grafted, the operation being long and difficult, but entirely successful. The animal recovered a very satisfactory general condition of vigour, health, and liveliness, and lost the signs of old age. Here the operation was excellent, preserving an animal used for cross-breeding. The animal had splendid qualities, and could continue its breeding functions for some time."

Mr. Newton, professor at the veterinary school at Buenos Aires, had a similar result with an old bull. The photographs which he sent us render comment superfluous.

Besides the failures encountered by Mr. Velu in grafting young rams in Morocco, you are familiar with the fine results obtained at Tadmit by Trouette, Bosselut, and Roux, with young Algerian rams. The superb grafted rams sent by the General Government of Algeria to the recent International Colonial Exposition, held at Paris, were admired by millions of visitors. In Russia, Dr. Vera Polovtzew has obtained similarly excellent results, but only in increasing the weight of wool. The veterinary Denissoff, of Leningrad, has been charged by his Government with the application of our method on a large scale. The report, which he has just presented after two years' experience and severe testing, and which Professor Gabriel Petit offered on March 8th last to the Society of Comparative Pathology in

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Paris, shows that the grafting method increases the weight of sheep by four to six kilograms per animal, and increases the weight of each fleece by 340 to 520 grams. This result is not so notable as that obtained by the veterinaries in Algeria, but it is, nevertheless, an unquestionable proof of the beneficial effect of the grafting method. Denissoff concludes his report to the Russian Government by stating that the grafting procedure is " a lucrative operation for the industrial rearing of wool-bearing animals."

This new factor in animal raising will naturally give better results if applied to sheep which have not been previously selected, or which inhabit regions where systematic animal raising is neglected. Animals which have undergone the process of selection for several generations have, in a way, reached the limit-yield of which their race is capable, and with such animals the result will be very ordinary, or even wholly absent. It is for this reason that the best results have thus far been obtained in Algeria, in the Soudan, in Senegal, and in Russia, and not in the Transvaal, or in Australia, where sheep have been pushed to the extreme limits of their development. An old animal may be rejuvenated by the grafting method in any region or country, as with the old horse of the King of Spain, grafted by Lopez Cobos ; but for increasing the weight of the body and the wool in young sheep, it is necessary to make a judicious selection of herds and flocks whose ancestral qualities still remain latent, and which will be revealed by the process of grafting. We may then conclude that glandular grafting, as applied to domestic animals, may contribute usefully to the economic prosperity of certain regions and countries, especially in the Colonies.

CONTRIBUTION TO THE SYMPTOMATOLOGY AND THERAPY OF PIROPLASMA CABALLI.

By A. BERGTHAL,

Government Veterinary Officer, Department of Agriculture, Forestry and Fisheries, Palestine.

RECENTLY numerous cases of an illness among police horses came under my notice, the disease manifesting itself in jaundice, indigestion, and a high temperature. The clinical appearances suggested the presence of some blood parasite, although such parasites could not be found after several blood examinations. In the majority of the cases the suffering animals were country-bred horses, and these have been found to possess a more or less natural resistance to diseases caused by protozoa. Only in this way could it be explained that numerous horses which became ill, with symptoms of slight fever, indigestion, colic, and yellowish discoloration of the mucous membranes, recovered without any treatment, or otherwise the disease lasted in the same stage for weeks, and even months. During the summer of 1931, a number of police horses in the Ramle division became sick, showing symptoms of icterus and high temperature, indigestion,

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sometimes accompanied by colic, which later on was diagnosed as *Piroplasma caballi*. Tick fever is known to exist, and to be widespread among the cattle of Palestine, and it can now be diagnosed and treatment instituted. This condition is seldom, however, ascertained in equines, as the diagnosis of equine piroplasmosis is difficult in local animals, and rarely can the existence of parasites in the blood be verified. The two forms of equine piroplasmosis known to exist in Palestine are *Nutallia equi*, found sometimes in horses, asses and mules, and *Piroplasma caballi*, which is more rare. During the present year there was a great invasion of ticks in Palestine, and tick fever thus took a form more serious in character. The disease appeared and spread among the horses during the summer months from May to August, and even September.

At the onset of the illness a high temperature of 40–41.3° C., with a pronounced dullness, is notified. The animals keep in a corner, droop their heads, and tears ooze from their half-closed eyelids. If urged to move they walk lazily and with some difficulty, and frequently the gait is staggering. Œdematous swelling of the scrotum and that of the hind legs over the hind fetlocks has often been noticed. The conjunctiva and the visible mucous membranes become yellow. Icterus varies from a slight yellow to an orange-yellow colour, proportionate to the severity of the affection. Numerous petechiæ are to be seen on the conjunctiva (*Membrana nictitans*) and in the mucous membranes of the nose and mouth, quite similar to that which are seen in petechial fever. Heart action in acute phases of the disease is greatly accelerated. The thorax presents signs of infiltration of the lungs, and the respiration is laboured and of the costo-abdominal type. Auscultation reveals intensified vesicular breathing, râles, and sometimes indefinite breathing sounds. From the beginning of the acute stage of the disease the appetite is depressed, whereas the thirst is increased. At first there is constipation, during which the fæces are dry. Later they become softer, and constipation alternates with diarrhœa and colic symptoms. The urine is dark-yellow in colour.

Courses of the Disease.—After the initial rapid rise of the temperature, associated with an appearance of dullness, the temperature remains for some three to ten days at 40–41.3° C., whereupon in some cases it gradually returns to normal, or it becomes chronic. In this form it may last for weeks, and even extend over a period of several months, with main symptoms of chronic indigestion, colic, emaciation, anæmia, and swelling of hind legs and scrotum. These swellings, and the hæmorrhages on the mucous membranes often remain for some considerable time after disappearance of other symptoms. The animal shows an inclination to ingest sand. The majority of horses exhibit only a moderate temperature of 39–39.5° C., with diminished appetite. Slight yellow discoloration of all mucous membranes, as well as symptoms of indigestion, have been observed. In such cases the illness may pass even unnoticed, and patients recover rapidly after the disappearance of the described symptoms, or, as mostly happens, it takes a chronic course, and lasts for several months.

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Diagnosis.—The disease may be recognised by the presence of marked icterus and fever, the recognition of which, however, is only possible by the demonstration of *Piroplasma caballi* in the red blood corpuscles, which in the cases observed by me were reported to be very rare. The following is a report received from the Government Veterinary Laboratory with regard to examinations carried out on blood of horses which were affected : " Blood slides received from you taken from the following horses : Nos. 338, 303, 365 and 612, showed the presence of *Piroplasma caballi*. These were present in very small numbers, the most heavily infected showing about five or six parasites after prolonged search of several slides. In the other cases it was only after examining two or three films that a piroplasm could be demonstrated."

It may be pointed out that the assertion of Descazeaux, that the severity of the illness stands in no proportion to the number of parasites in the blood corpuscles, and that it depends only upon their virulence, has been corroborated by the present outbreak.

Treatment.—The first treatment consisted of large doses of quinine sulphate, 15–20 gr., which did not always prove successful, as many relapses occurred, and in some instances the temperature, after having dropped, would rise again. My attention was then drawn to a new remedy, which has a specific effect in piroplasmosis in cattle, and is known as trypaflavin (3.6 diamino—10 methylacridinum chloride). Trypaflavin has been applied intravenously in an aqueous solution, 50 grammes of a 2 per cent. solution. The result of the treatment becomes manifested by the rapid fall of temperature and disappearance of the symptoms of dullness. It is also marked by the disappearance of the parasites in the blood, as confirmed by laboratory examination. The temperature becomes normal, and an astoundingly quick improvement follows. Trypaflavin is injected into the jugular vein. The necessary amount is dissolved in sterile boiled water, and applied with a sterile syringe. The excretion of the drug occurs within a few hours, through the urine, which assumes a yellowish-green to brown colour. Trypaflavin spreads in the organism in the same way as a vital dye, *e.g.*, it colours almost all the organs, and therefore is also seen in the urine. Great care must be exercised with trypaflavin when injected intravenously that not even the smallest quantity should be injected outside the vein, as it causes extensive swellings of the perivascular tissues. Altogether ten horses were treated with trypaflavin, and the history of three of them is given as follows :

Horse No. 612.—Country-born stallion, six years old. The horse was reported to be sick and not feeding. Jaundice, hæmorrhage spots on the conjunctiva, temperature 41.1° C. Blood examination revealed the presence of *Piroplasma caballi*. *Treatment.*—On August 9th, 1931, an injection, intra-jugular, of 50 c.c. 2 per cent. solution of trypaflavin. Temperature dropped by next morning to 38.3° C. The horse recovered completely.

Horse No. 365.—Country-born stallion, five years old. Was reported to be off food on August 8th, 1931. Temperature was 41° C. Jaundice with hæmor-

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rhagic spots on the conjunctiva. Blood examination proved that the horse was suffering from *Piroplasma caballi*. *Treatment.*—At the beginning consisted of quinine sulphate. No improvement being noticed, an injection of 50 c.c. 2 per cent. trypaflavin solution was administered. The temperature dropped within the following two days to normal, and the horse quickly recovered.

Horse No. 338.—Country-born stallion, nine years old, which was reported on July 20th, 1931, to be sick. Temperature 41.3° C. General jaundice and hæmorrhagic spots on the conjunctiva and on the mucous membranes of the mouth. The horse appeared to be very ill. Blood slides examined in the Government laboratory proved that the animal was suffering from *Piroplasma caballi*. *Treatment.*—This consisted of an intravenous injection of 50 c.c. 2 per cent. trypaflavin. The temperature dropped by next morning, and gradually became almost normal. A rise of temperature occurred on July 25th, due to an extensive swelling of the place of injection, but the animal recovered completely after one injection of trypaflavin.

In conclusion, it would appear that the intravenous injection of trypaflavin constitutes a very useful form of treatment in piroplasmosis of the horse due to *Piroplasma caballi*.

Clinical Articles

Some Wound Cases.

By G. MAYALL, M.R.C.V.S.

Bolton.

THERE are few occasions with us that cause more room for the exercise of intelligence than the treatment of wounds caused by accident or deliberately inflicted. Lotions and liniments have their limitations, and in most cases, unless frequent and repeated bandaging accompany them, they are only transient in their effect. Punctured wounds are generally troublesome, and injections of liquid antiseptics into them do not always produce the favourable results we desire. The old treatment of wounds, which chiefly resolved itself into keeping them dry and clean, had some points in its favour. Early this year I had an Irish terrier dog that had its radius and ulna broken in fighting with another dog, and also eight or ten punctured wounds down a fore-leg caused by the canine teeth of his opponent. He belonged to a poor man of a happy-go-lucky and indolent disposition, and my puzzle was to cure the dog at least expense to myself, and most satisfaction to the owner. I cleaned the limb down with some eusol, and then instilled (but did not forcibly inject) each punctured wound with tincture of iodine. I set the fracture and wrapped iodoform tape all up the limb, and

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put a good Burgess plaster firmly round the leg (I never use splints). I quite expected to have the dog back in a few days' time for further attention, but it is gratifying to relate that he never looked back, and I took the bandages off in five weeks' time, and the dog is as good as ever he has been, and what is more, I got paid enough to recompense me for the job, but made no profit.

A month ago a fox-terrier dog, " Pongo," was brought to me late at night with five punctured and septic wounds over the under surface of his chest and abdomen. I dressed them with tincture of iodine. Next day they were very sore and painful, and discharging freely. Sinuses had formed, which ran down to the breast bone and across it, and periostitis and peritonitis seemed imminent. I thought to myself I must get these punctured wounds aseptic, and I do not think much of injections in the position these wounds are in. I bethought me (as they say in Lancashire) that I had some boric acid teat bougies in stock, so I got one of them, moistened it with chinosol solution, and dipped it in iodoform, and passed it freely into all the sinuses and punctured wounds, and to relieve the soreness of the whole region I put a kaolin dressing, kept in place by a broad bandage, all over the under surface of the body. For the next few days the insertion of the bougie and the kaolin dressing as mentioned were persevered with, and the dog was discharged cured in fourteen days. It was a bad case, which showed visible signs of improvement by relief of soreness and pain, and gradual lessening of the discharge and closing up healthily of the holes a few days after the above treatment was instituted.

An old hunter, used, perhaps riskily, to pull a two-wheeled timber cart, took it into his head to imagine he was following the hounds, and got off and ran full tilt into a brick wall, denting the wall, smashing the shafts, knocking out three incisor teeth in the lower jaw, puncturing the off side of his face, and causing a semi-circular wound right round the front surface to the back of the off knee. We got him up and walked him back to the stable, where I put ten stitches in the knee, and dressed the mouth and face. There was great swelling of the off leg, which was reduced by cold water and kaolin bandaging. The knee wound was treated almost exclusively with dry dressings of boracic acid and iodoform, followed by zinc oxide and copper sulphate; but an important item which benefited the case considerably was a daily application of boracic acid and chinosol pessary pencilled over the wound: when melted a bit and rubbed over the wound it formed a protective and antiseptic film and helped the healing process considerably.

A black-and-white tom cat had four pustules on his right ear. These burst, and left four well-defined shallow depressions which were very slow in healing notwithstanding application of tincture of iodine, pellidol and zinc ointments. Eventually they were healed after pressing down iodoform into the depressions with the moistened end of a teat bougie. I never saw such an obstinate case to heal in the cat before, and it took forty-eight days to set him right, although he was a good fellow, and never interfered with his ears all the time.

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A Large Subcutaneous Lipoma.

By A. B. ORR, B.Sc., M.R.C.V.S.
Department of Pathology, Royal Veterinary College.

A LIPOMA about the size of a cocoanut was removed from the right hip of a cross-bred terrier bitch, aged about eight years, in August, 1929. In April, 1932, the bitch was brought to Mr. J. Davies, M.R.C.V.S., for destruction, on account of an enormous ulcerating growth which involved almost the whole of the right hind leg. The owner stated that apart from the growth the dog had always been in perfect health. The carcase was brought to the laboratory for examination by Mr. Davies, to whom I am indebted for the clinical history.

The post-mortem examination revealed a lobulated lipoma which was confined to the subcutaneous tissue of the right hind limb, and extended anteriorly into the flank, superiorly to the midline of the croup, and inferiorly to about half-way down the metatarsus. The greater part of the growth was on the posterior aspect of the leg (*see* photographs, *Plate II*), but actually the limb was surrounded by the lipoma. The tail, anus, and vulva were not involved, and about three inches to the right of the anus there was a small depressed hairless area—the scar of the operation wound made in August, 1929. The whole tumour was firmly attached to the overlying skin, and at the lowest point of the posterior border there was a recently-formed shallow area of ulceration.

There was general emaciation of the carcase, but otherwise no other abnormality was found.

A Few Notes on Routine Cases of Parturition in the Ewe.

By K. A. MILES, M.R.C.V.S.
Husbands Bosworth.

SHEEP the last few years have been one of the best paying propositions on the farm, and in consequence many ewes unable to lamb naturally have been brought to my surgery. One of the commonest causes of dystokia is the use of a large-headed breed of ram with one of the smaller breeds of ewes. In this case the forelegs are usually presented, or easily found, and put into their normal position, but the head is always the " other " side of the pelvic cavity, and usually the lower jaw has been " roped " by the shepherd before calling in the veterinary surgeon, and in many cases either pulled off or thoroughly broken up. Vulsellum forceps are very useful, as they can be fixed on any part of the head. I find that if one hooks the first joint of one's second finger in the eye socket of the lamb, one can exert a lot of traction on the head without causing the hand to bunch (if one grasps the lower jaw between thumb and finger there is not room for the hand to be withdrawn through the pelvic cavity). The head can then gradually be pulled into the passage, where it can be seized with the Vulsellum forceps if the hand has by that time become cramped. With the forelegs now in position the lamb can then be removed.

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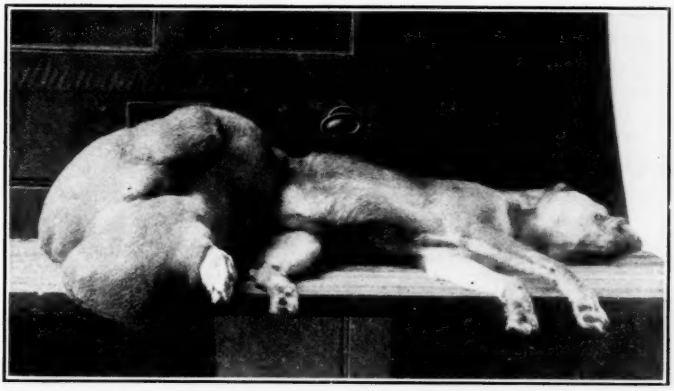

FIG. 1.
Showing the size and position of the lipoma as seen from the outer aspect of the leg.
(See page 308)

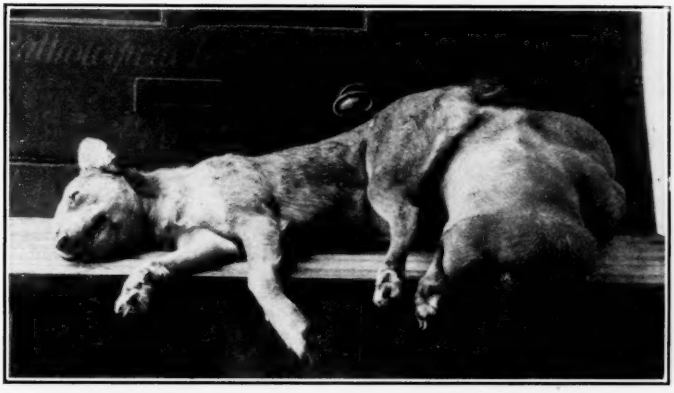

FIG. 2.
The inner aspect of the lipoma. The growth is confined to the right side of the mid-line.
(See page 308)

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Another common case is persistent closure of the os uteri. The cause of this, I am inclined to think, is an injury at a previous lambing, with the formation of scar tissue on repair. My method of procedure is to apply belladonna ointment, wait an hour or two, and then gently, or rather gradually, force one's hand through the partially closed os. One, of course, tears the tissues in many cases. One then hopes that the lamb is not of the large-headed type. If the uterus is not ruptured and the ewe not too exhausted, recovery usually takes place. It is inadvisable to breed from her again.

Breech presentations are usually easily rectified, especially in the case of twins or triplets ; but I have had two cases recently of breech presentations with deformed lambs ; the joints of the hind legs have been immovable and rigid. Delivery has only been effected after cutting through the leg at the hock joint and the rest of the leg turned after this procedure.

I can never recall a case of torsion of the uterus in a ewe, and as this is quite frequently met in cows, I should like to know if other practitioners have found this condition in ewes. Following difficult dystokia, after-treatment consists of inserting antiseptic pessaries and some stimulants and internal antiseptics : spts. ammon. aromat. and ol. tereb. in milk are very satisfactory.

Translations

A Further Contribution to the Anæsthetisation of the Horse's Head. By Dr. W. Bolz, *Chief Assistant of the Surgical Clinic, Berlin Veterinary College. Berliner Tierarztlichen Wochenschrift*, 46 (1930), No. 33, S. 539.

During the last few years various articles have appeared that deal with the anæsthesia of horses' heads. The American, Dr. Bemis (1917), was first to anæsthetise the nerves of the teeth : he injected the nerve which required to be anæsthetised before it enters the upper or lower jaw. He blocked the infra-orbital nerve, which supplies the dental branches to the molar teeth of the upper jaw, at the place where the nerve enters the maxillary foramen. Anæsthesia was produced in ten to twelve minutes, and lasted from twenty to thirty minutes. He blocked the mandibular nerve at the mandibular foramen,—this nerve supplies dental branches to the molar teeth of the lower jaw.

These observations of Dr. Bemis were tested by Schrader (1924). The technique of blocking the nerves at the point of entrance into their corresponding foramen is easy. Bemis (1917) advised that the injection should be done, casting the horse first, otherwise there is danger of breaking the needle ; but throwing the

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horse down ought to be avoided if possible, as Schrader experienced unpleasant complications, such as: the transverse facial artery (and in another case the reflex vein) was punctured. Therefore Schonberg (1927) decided to block the nerves at the point where they " come out " from the jaw. In the case of the infra-orbital nerve, he injected at the infra-orbital foramen; and in the case of the mandibular nerve at the mental foramen. He showed, by injecting a coloured fluid, that the fluid injected travelled along the nerve trunk.

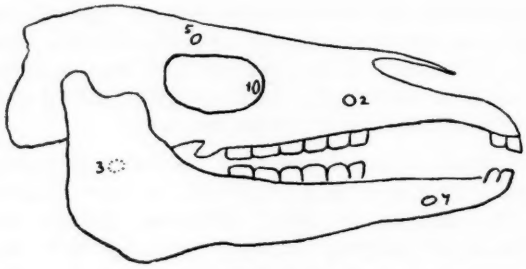

FIG. 1.
(1) Maxillary foramen; (2) infra-orbital foramen; (3) mandibular foramen; (4) mental foramen; (5) supra-orbital foramen.

Clinically, Schonberg's anatomical attempts were performed by Wittmann and Morgenroth (1928). They maintained, after the injection into the infra-orbital foramen, that the gums, the periosteum and the bones were in an insensitive condition. And, on the contrary, the injection into the mental channel *via* the mental foramen showed uncertain in effect, because the fluid often receded from the channel, and found a channel beneath the teeth.

The treatment of wounds on the lips and nose can also be done under this technique of anæsthesia whilst the horse stands. For operation on the eye, Jacob (1920) recommends the lateral and medial orbital injections. For this he used an 8 to 12 cm. needle, which he put deep in the orbital edge, and by this combined method he succeeded usually in causing a perfect anæsthesia of the soft part of the orbit and the soft part of the neighbouring surrounding tissues.

In the Berlin clinic the following technique is practised: The injection is done through the supra-orbital foramen into the peri-orbita of the eye; this way of injection is not difficult; but due to the fact that the supra-orbital foramen is not very big, only a very thin needle can be passed through it, and an oblique polished needle of No. 1 size is useful. It is sufficient to insert the needle 2 cm. deep, so that the anæsthetic shall enter the peri-orbita. Some minutes after the injection there was an œdema of the upper eyelid, which disappeared in one to five hours after the injection, according to the strength of the injected fluid used,

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and left no injury. Anæsthesia was produced in seven to ten minutes after the injection, and the region involved is the forehead and upper eyelid, which remain insensitive for seventy to eighty minutes.

In the region of anæsthesia wounds can be sutured and " trephining " can be undertaken without using any restraint.

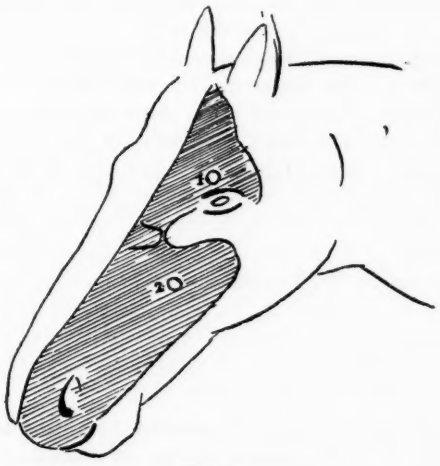

FIG. 2.

(1) Supra-orbital foramen; the shading indicates the region of insensitiveness.
(2) Infra-orbital foramen.

According to the reports of Moller (1910), Jacob (1920), and Mayr (1926), which agree with the experience of the Berlin clinic, it is the upper eyelid which is mostly wounded, and thus by injecting through the supra-orbital foramen there is a possibility to treat at least the greater part of wounds of the eyelid under local anæsthetics.

In conclusion, if the trephining of the maxillary sinus demands also an opening in the frontal sinus, it is recommended to use Schrader's injection of the infra-orbital nerve into the channel of the same name, and also blocking of the orbital nerve *via* the supra-orbital foramen.

SUMMARY.

(1) The technique to inject the orbita, *via* the supra-orbital foramen, is easy.

(2) The parts which become anæsthetised reach around the frontal sinus to the middle line, and extend to the upper eyelid.

(3) The use of this technique is suitable for operations on the upper eyelid, and in the frontal sinus.

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Abstracts of Current Literature

Small Animal Practice in the United States.—By Dr. D. M. CAMPBELL, *Editor of "Veterinary Medicine," Chicago, Illinois.*

A SURPRISING circumstance in connection with the changes that have come about in the field of veterinary practice in a score of years is the failure of many to recognise the importance of that branch of veterinary practice that serves the owners of animal pets. The American Veterinary Medical Association certainly cannot be accused of being indifferent to the welfare of any branch of the veterinary profession, and one must conclude that it was due solely to lack of information as to the importance of small animal practice that it delayed until recently establishing a separate section for those interested in this branch of veterinary service, notwithstanding the most insistent demands for such a section from a considerable number of influential members of the Association. The instant success of the section on small animals, when it was finally established, affords sufficient evidence of the need for it. The continued preponderance of time given to equine anatomy and to diseases of the horse in veterinary college curricula is perhaps due to a further failure to appreciate the changed conditions that influence veterinary practice at the present time.

The report of the Committee on Education of the American Veterinary Medical Association, presented at the annual meeting in August, 1931, is illuminating in this respect. This report was prepared by the late Dean Bemis, and comprises the results of a two-year study of the whole veterinary situation. Dean Bemis puts the total number of graduate veterinary practitioners in the United States at 9,359, and the number interested in any degree in the treatment of pets at 81 per cent., or more than 7,500. More important, however, is his findings that the attention given to pets is equivalent to the whole time of 2,250 veterinarians, and that 1,010 give more than 75 per cent. of their time to small animal practice. It seems reasonable to conclude that double this number, or 2,000, are engaged from 25 per cent. to 75 per cent. of their time in small animal practice, making altogether 3,000, for whom the treatment of pet animals is an important source of income. This places the number engaged in this type of practice well ahead of the numbers engaged to an equal extent in horse practice or swine practice or all phases of health work combined, and makes it second only to the number engaged in cattle practice.

The experience of *Veterinary Medicine* in the publication of a special "Small Animal Practice" issue in April, 1929, substantiates in a measure the foregoing conclusion. The success of that issue was instantaneous. The continued demand for it after all copies of the regular issue were exhausted led to the preparation of a reprint, with more substantial binding than that of the magazine. It was deemed that 1,000 reprints would be amply sufficient to supply any demand that

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might accrue, inasmuch as all subscribers had this same material in copies of the magazine, but this supply of reprints was soon exhausted, and a second reprint of the same quantity issued, which in turn was exhausted, and within a year from the date of the original publication, and in April, 1930, a third reprint, increased to eighty pages, was issued. Of the 1,000 copies of the third reprint, more than half have already been disposed of, and the indications are that the remaining copies may be insufficient to supply the demand for it that will eventually accrue.

Hans Messner.—The Examining of Faulty Milk Cans. *Prager Archiv. f. Tiermed.*

In practical milk control faulty milk vessels made of tin are often met with, which the traders plug up with soap on the outside to prevent the escape of milk. It is beyond question that such vessels should be objected to. The School for Food Inspection in Vienna has condemned such milk cans, and observes: "Milk cans having fissures and splits which go through the whole thickness of the walls are in such a condition that they no longer can be effectively cleaned. In those smeared with soap outside, but inside with gaping fissures which continually harbour milk curds, mechanical purification of the cans is not possible, advancing bacterial decomposition sets in, and nests of out-of-the-way bacterial flora form, and at every new filling of the can the milk is bacterially contaminated. Such contamination, in the unfavourable conditions of handling and preservation of milk, may be the starting point for the development of an advancing bacterial flora in this milk, and bring about various decompositions in it. The significance of the possible results of such contamination of milk is all the more serious when one considers that milk is often the chief nourishment of infants and children, and may under such conditions bring about severe disturbance and diseases of the digestive organs. Such milk vessels are not suitable for the preservation and transport of a liquid food material, and their use must be discarded in the interest of human health."

M. F. Lestoquard.—The Early Biological Diagnosis of Pregnancy. *Revue Vétérinaire.*

Quite recent researches have made this important question of physiology the order of the day; also, by reason of the interest which it presents from the veterinary point of view, we give here the analysis of the work of Hinglais, published in the *Journal médical francais* in January, 1931, this number being entirely devoted to the diagnosis of pregnancy. In the first chapter the author reviews old researches, shows the results which one may expect from them, also their defects and imperfections. In this way he passes successively in review the processes of diagnosis based on the phenomenon of glycosuria brought about on the physico-chemical modifications of blood serum, on the reactivation of cobra venom, on the reaction of Abderhalden. This reaction of Abderhalden certainly constituted the best process, but was far from being infallible; experience showed it to be little

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specific and precisely in those puzzling cases in which a certain biological reaction would have been necessary. That is why modern researches have been directed towards other channels. These investigations have had as their object of research the existence of specific hormones, and of utilising them in a special manner for the diagnosis of pregnancy. It is known to-day that the activity of the female genital organs is dependent on internal glandular secretions or hormones. Normally these sexual hormones, narrowly specific, exist, but only in such small quantity that they are almost undetectable. On the contrary, during pregnancy they appear in the blood and urine in important quantity, and are easily detected. Three hormones are actually known that have an action on the female genital tract. These are folliculine, the hormone of the yellow body, and the sexual hormone of the anterior lobe of the hypophysis. Folliculine, the best known of the three hormones, is the issue of the follicles of Graaf; it determines in the genital organs the phenomena which characterise the period of rut or heat. Injected into castrated or non-adult females it causes the appearance of the sexual cycle. However, it cannot serve as a diagnostic of pregnancy, because it only becomes plentiful towards the fifth month of gestation, which is too late, and exposes it to errors of fact, as it exists in such large quantity at the periods of rut.

The hormone product from the yellow body is only detectable during pregnancy from the second month, but research into it as applied for diagnosis of pregnancy presents difficulties of a technical nature which have caused it to be rejected. It is the antehypophysary hormone which gives the clue to the problem that occupies us. In fact this hormone constitutes the primordial excitant of the functioning of the ovary. It is the one which determines the growth of the follicles of Graaf, their maturity, and the production of yellow bodies. It only exists in subjects endowed with genital activity, and as a result is totally absent from the organism of females in impuberty or menopausic state. In the normal state it only exists in such a low quantity that its presence can perhaps only be demonstrated by the graft or ablation of the hypophysis, its presence in the humours not being detectable. From the beginning of pregnancy, on the contrary, it appears in large quantity in the blood and urine of the female in this condition.

Its use as a diagnostic of pregnancy rests on the following experimental facts: injected into an impubert female it upsets natural ovarian functioning; injected into a female at puberty it exaggerates the activity of the ovaries and the production of yellow bodies. However, used in these conditions in females, the diagnosis may sometimes be in error on account of inter-reactions between the hormone and the folliculine. Also it is preferred to make use of a male animal such as a small mouse. In fact the injection of the urine of a pregnant female into a small male impubert mouse occasions in a few days the appearance of puberty, characterised by an enormous development of the vesiculæ seminalis, the testicle itself remaining little changed. The reading of the result is therefore always possible macroscopically, and the microscope is no longer indispensable. This reaction, used for the examination of 300 specimens of urine, has never yet failed, and has given 100 per cent. of exact diagnoses.

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Technic.—The urine is filtered after slightly acidifying with acetic acid. For ten days one inoculates 0.3 c.c. of urine each day, and one kills the mouse on the tenth day. At the autopsy, naked-eye examination suffices to read the result : Voluminous vesiculæ seminalis of whitish and turgid aspect. Diagnosis can thus be determined at the end of the eighth day after the onset of pregnancy, even in the case of extra-uterine gestation. The reaction ceases to be positive from the fourth day after accouchement, or after the interruption of pregnancy by a surgical intervention, or after the death of the fœtus. It is negative in the case of tumours, fibromas, cysts of the ovary, etc. Finally, in a recent publication, A. Brouha has determined that the intravenous injection into an impubert rabbit of 5 c.c. of the urine of a pregnant female produces in forty-eight hours the appearance of hæmorrhagic follicles at the seat of the ovary. The result of this last test would be remarkable in its quickness, but needs to be verified. These results have induced us to undertake researches in the veterinary domain. In Germany researches carried out on the mare have been found to register analogous facts to those observed in woman. It seems therefore that one really possesses for the early diagnosis of pregnancy a very valuable reaction which is specific, constant, easy and early to realise, since it outstrips clinical examination.

Manilov.—Diagnosis of Pregnancy by Means of Chemical Reagents. *Soc. de Biologie.*

Two reagents in the presence of a serum of woman allow of diagnosing whether she is pregnant or not in 91 to 96 per cent. of cases. The required reagents are : (1) An aqueous solution of diuretin at 2 per cent. (the diuretin ought to be completely dissolved) ; (2) a solution of 0.2 per cent. (one-fifth per cent.) of Nile blue in alcohol. One takes five to six drops (0.3 c.c.) of fresh serum for the test, and adds 1 to 1.5 c.c. of the first reagent, which is then mixed, and one drop of the second reagent is added. The test tube is then shaken. If the serum becomes yellow, yellowish or reddish-yellow, it certainly indicates that the woman is pregnant ; if the woman is not pregnant it takes a blue or reddish-blue tint. Errors (4 to 8 per cent.) occur in feverish or cancerous subjects. It is well to take a serum of a non-pregnant woman and that of a woman undoubtedly pregnant, and to compare the two tubes by the light of day ; the difference is clear and plain. This simple method would undoubtedly give comparable results in domestic animals. To know it is only to prove it.

M. Mariani.—Diagnosis of Gestation by the Novocain-Formaline Reaction. *La Clinica Veterinaria.*

Costa's reaction consists in the test of sedimentation of the hæmatins in the presence of a solution of novocain. To 1½ c.c. of a 2 per cent. solution of novocain one adds three drops of a 5 per cent. solution of citrate of soda and three drops of the blood to be tested, which is mixed by agitation. This is

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centrifugalised until the mixture becomes limpid, and then one drop of pure formalin is added. The reaction is positive if in fifteen minutes a grey or greyish-yellow precipitate forms in the test material; it is abolutely positive if the precipitate forms in two minutes. Tests have been carried out on thirty-four female animals (mares or cows); in twenty-four, one test only sufficed to recognise the presence or absence of gestation; in five the result was doubtful, and in two erroneous. Further study of the results show: (*a*) The novocain-formalin reaction, in the great majority of cases, allows of the diagnosis of pregnancy in mares and cows. (*b*) Diagnosis has been possible from the twenty-sixth to sixty-eighth day after fecundity. (*c*) The formation of precipitate (positive reaction) has persisted in cows from thirty-six to fifty-seven days after parturition.

News

"VETERINARY SURGEON"—FIRST PROSECUTION UNDER 1931 ACT.*

This is the first prosecution to be brought by the Veterinary Council of Saorstat Eireann since its establishment under the Veterinary Surgeons Act passed last year, said Mr. Geroid O'Sullivan, B.L., T.D., in Athenry District Court, when three summonses were brought against Patrick J. Nolan, North Gate Street, Athenry, for: "Not being a registered veterinary surgeon did represent or hold himself up as being a proper person to practice veterinary surgery or veterinary medicine on various dates between May 9th, 1932, and May 14th, 1932, and did on May 11th, 1932, practise veterinary surgery by performing an operation on a colt, the property of Edmund Kennedy, Kingsland, Athenry, and did perform a similar operation on a colt the property of Michael Higgins, Lisheenkyle, Athenry, contrary to the Veterinary Surgeons Act, 1931."

Mr. O'Sullivan said the defendant published in a local paper a notice that he would attend different places in the district "for the purpose of operating on horses, and guaranteeing perfect cure of all classes of animals with broken bones, and horse docking thoroughly executed."

In Co. Galway, said Mr. O'Sullivan, there are eight qualified veterinary surgeons who are on the register, and one of them, Mr. MacDermott Kelly, resides in Athenry. Veterinary surgeons are not allowed to advertise their practice; they have expended a good deal of money in getting qualified, and it was for the protection of the public from loss by the depredation of persons of the type of defendant that the Act was passed. Mr. Joseph Lawrence Denning, Registrar of the Veterinary Council, said defendant was not on the register. He told Mr. Blake that the prosecution was taken on the instructions of the Council, and the first intimation defendant got was the prosecution. To Mr. O'Sullivan he said there was a previous prosecution reported against defendant for cruelty to a horse in performing one of these operations.

Ml. Higgins gave evidence of Nolan having performed an operation on a colt, for which witness gave five shillings. To Mr. Blake witness said the work was

* Abstract from the *Dublin Evening Mail*, June 16th, 1932.

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done satisfactorily, and witness was aware that Nolan and his father carried on the work in that district all their lives.

Mr. O'Sullivan.—Did you ever hear of him performing anything but a satisfactory operation ?

Witness.—I cannot say.

Mr. O'Sullivan.—Did he wear a white coat when performing these operations ?

Witness.—He had no coat at all, sir.

Mr. Blake pointed out that this was the first prosecution brought under the Act in the Free State. A number of men like Nolan had been performing these operations throughout the country, and the skill and experience in such work remained. Defendant was fined £10 on each of the three cases, with three guineas costs in each case. The fine in each case was mitigated to £5.

BRITISH MEDICAL ASSOCIATION CENTENARY MEETING, LONDON, JULY, 1932.

SECTION OF COMPARATIVE MEDICINE.

President : Professor F. A. E. Crew, M.D., D.Sc., Edinburgh.

Vice Presidents : Joseph A. Arkwright, F.R.S., M.D., F.R.C.P., London ; Professor J. B. Buxton, F.R.C.V.S., Cambridge ; Sir Frank J. Colyer, K.B.E., F.R.C.S. (London) ; Colonel A. E. Hamerton, C.M.G., D.S.O., M.R.C.S., R.A.M.C. (retired), London ; Professor Frederick T. G. Hobday, C.M.G., F.R.C.V.S., London ; Professor T. J. Mackie, M.D., Edinburgh ; Sir Peter Chalmers Mitchell, C.B.E., F.R.S., LL.D., D.Sc., London ; Major-General Sir John Moore, K.C.M.G., C.B., F.R.C.V.S., London.

Honorary Secretaries : S. Zuckerman, M.R.C.S., L.R.C.P., 7, Ormond Terrace, N.W.8 ; T. W. M. Cameron, Ph.D., D.Sc., M.R.C.V.S., Zoology Department, The University, Edinburgh.

Wednesday, July 27th.—10 a.m., Discussion : " The Menstrual and the Œstrous Cycles." To be opened by Dr. S. Zuckerman (London), followed by Professor W. Frei (Zürich), Dr. A. S. Parkes (London), Dr. B. P. Weisner (Edinburgh), and Mr. R. Grant (Edinburgh). Papers : " The Genetics of Derangements Common to Man and Animals," Professor F. A. E. Crew (Edinburgh) ; " The Pregnancy Test in Mares," Mr. W. C. Miller (Edinburgh).

Thursday, July 28th.—10 a.m., Discussion : " The Ætiology of Dental Caries." To be opened by Mr. E. W. Fish (London) and Mrs. May Mellanby (Sheffield), followed by Dr. I. H. Maclean (London), Mr. W. Warwick James (London), Dr. F. W. Broderick (Bournemouth), Mr. J. G. Turner (London), Dr. E. C. Sprawson (London), and Dr. T. Hare (London). Paper : " Nerve Degenerations in Equines," Major W. M. Mitchell (Edinburgh).

Friday, July 29th.—10 a.m., Discussion : "Senescence." To be opened by Dr. G. P. Bidder (Cambridge) and Dr. B. P. Weisner (Edinburgh), followed by Professor W. R. Miles (Stamford, California), Professor H. A. Harris (London), Professor M. J. Stewart (Leeds), Major S. S. Flower (Tring), and Dr. W. Cramer (London).

AN OUTBREAK OF FOOT-AND-MOUTH DISEASE IN U.S.A.

Foot-and-mouth disease was diagnosed in a herd of 4,000 garbage-fed hogs at Buena Park, Orange County, California, on April 29th. The suspicions of Dr. L. M. Hurt, Los Angeles County Live Stock Commissioner, had been aroused when his attention was directed to the existence of sick hogs in the herd. These

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exhibited symptoms strongly suggestive of-foot-and-mouth disease, and diagnostic tests subsequently confirmed these suspicions. Dr. Jacob Traum, of the University of California, co-operated in making the diagnosis. Rigid quarantine restrictions were placed in effect immediately. The same day that the diagnosis was made in the first herd, the disease was detected in a second herd close by. Fortunately these two herds were well isolated from other live stock susceptible to the disease. Arrangements for slaughtering and burying these herds were under way the same day. By March 7th, the ninth day after the first diagnosis of the disease, all infected and exposed herds had been slaughtered and buried, and no new infection has been reported since that date. The 1932 outbreak is the sixth that has occurred in the United States. Previous invasions of the disease took place in 1870, 1880, 1884, 1902, 1908, 1914, 1924, 1925, and 1929. In 1924, the disease made its first appearance in California, and later in the same year in Texas. No connection between these two outbreaks was ever definitely established. The 1929 and 1932 visitations of the disease were first detected in garbage-fed swine. In all previous outbreaks, cattle had been the first animals affected.—*Journal of the American Veterinary Medical Association*, June, 1932.

CONTINUED REDUCTION OF BOVINE TUBERCULOSIS SHOWN BY SURVEY.

On May 1st, 1932, there were 1,421 counties in the United States designated as modified accredited areas by the U.S. Department of Agriculture. The extent of bovine tuberculosis in the country is now approximately 1.4 per cent., as against 4 per cent. ten years ago. In 1,415 counties the prevalence of the disease has been reduced to 1 per cent. or less, leaving 236 counties in which bovine tuberculosis exists to the extent of more than 1 per cent.—*Journal of the American Veterinary Medical Association*, June, 1932.

Reviews

Filterable Virus Diseases in Man. By JOSEPH FINE, M.D., B.Sc., D.P.H., D.T.M., Edinburgh, 1932. Pp. 142. 6*s*. net.

THIS book is a well-written summary of the symptomatology and pathology of the virus diseases of man. In addition to a judicious selection and condensation of a large amount of literature, the author has added to the usefulness of his work by presenting a classification, which " though admittedly open to the criticism of superficiality, nevertheless represents a workable arrangement for purposes of descriptive treatment." The diseases transmitted by an intermediate host are divided into (*a*) those transmitted by dipterous insects, viz., yellow fever, dengue, and sand-fly fever ; and (*b*) those transmitted by non-dipterous arthropods, *viz.*, typhus, rocky mountain fever, trench fever, and Tsutsugamuchi. The second division comprises virus diseases which are transmitted directly : warts, molluscum contagiosum and trachoma form one group ; herpes zoster, varicella and small-pox are a second ; poliomyelitis, acute disseminated encephalomyelitis, rabies, encephalitis lethargica, and disseminated sclerosis (?) are a third group ; and the fourth contains measles, mumps, influenza (?), common chill (?), and psittacosis. With the addition of " neoplastic " and " bacterial " divisions, the author classified in tabular form (Appendix II) the virus diseases of animals and birds. The first appendix summarises the main characters of the

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diseases described in the text. The subject index occupies two pages. The author has rendered a good service to medical practitioners and students. Probably he will accept as a compliment our hope that an equally capable writer will present a companion volume for the service of practitioners and students of veterinary science.

TOM HARE.

Animal Hygiene. By LEUNIS VAN ES, V.S., M.D. Messrs. Chapman & Hall, Ltd. Pp. 746. Figs. 78. Price 40s. net.

THIS new volume differs in type from contemporary standard text-books on the subject in that it is essentially a book showing the growing importance and practical application of the subject. The author has assumed that the reader has a certain amount of knowledge regarding the fundamental facts of hygiene, and this assumption is particularly noted on the first section, which is really a survey of general principles and methods; for instance, reference is made, page 215, to two types of drainage traps, while their method of functioning is only briefly described, and their relative advantages and disadvantages are not discussed. The second and major portion, consisting of approximately 400 pages, is devoted to a systematic individual consideration of all the animal diseases in the control or prevention of which the science of hygiene plays a part. In the case of each disease the associated problems are first carefully outlined, and then follows a discussion on the control and prevention measures indicated. Radical methods are not always possible on economic grounds, and the author has shown when and why the somewhat less efficient and not so drastic steps must of necessity be practised. Poultry problems are discussed, and a list of references is appended at the end of each chapter. The book is a useful addition to present works on the subject.

J. W. H. H.

Obituary

MAJOR R. EUSTACE MONTGOMERY.

MEMBERS of the profession will learn with the deepest regret of the death of Major Robert Eustace Montgomery, the Veterinary Adviser on Animal Health to the Colonial Office, Whitehall, which occurred in St. Thomas's Hospital on Saturday, June 11th. Major Montgomery, who was only in his fifty-second year, had had a very distinguished career, both as a student and as a member of the profession. Graduating from the Royal (Dick) Veterinary College, Edinburgh, in 1903, he was immediately appointed Demonstrator of Comparative Pathology in the University of Liverpool, and in 1904 became assistant Imperial bacteriologist to the Government of India. His enthusiasm for his work and his outstanding ability caused him to be selected as a member of several special investigation committees, and between 1907 and 1909 he was attached to the Sleeping Sickness Expedition which was sent to Central Africa by the Liverpool School of Tropical Medicine. He remained in Africa from 1909 to 1917 as Veterinary Pathologist to the East Africa Protectorate. In the latter year he was appointed Director of Veterinary Research to the Union of South Africa, and from 1920 to 1926 he was Veterinary Adviser to the Governments of Uganda, Kenya, and Tanganyika. In 1923 he was selected by his *confrères* as Chairman of the Pan-African Veterinary Conference at Nairobi, and the success of the gathering owed a good deal to his tactful influence. His research into animal diseases also included visits to the Republics of Argentina and Brazil, and his literary abilities found vent in his appointment as assistant editor of the *Journal*

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of Tropical Veterinary Science. There was probably no one in the veterinary profession who had had more experience or who was better versed in veterinary tropical diseases.

It was a happy and very fortunate selection on the part of the Colonial Office when Major Montgomery was chosen in 1930 for the appointment of Adviser on Animal Health. His genial disposition and quick grasp of difficult problems, together with his clear and original way of expressing his opinions, made him a welcome visitor wherever veterinary surgeons were assembled; and his untimely death is a blow to the profession from which it will recover with difficulty. His War services, from which he retired as a Major in the East African Veterinary Corps, brought him the 1914–15 medal, with mention in dispatches, and the Order of the Brilliant Star of Zanzibar.

STAFFORD JACKSON, M.R.C.V.S.

By the death of Mr. Stafford Jackson, the City of Liverpool loses one of its oldest and most respected citizens, and the members of the veterinary profession in that city will miss a very congenial colleague and friend. At one time Mr. Stafford Jackson had one of the largest city practices in the North of England, and his duties not only included attendance upon large studs of horses, but he was also veterinary surgeon to the Liverpool Cowkeepers Association, an association whose resources were at one time a great asset to the students of the Liverpool Veterinary School, on whose staff Mr. Stafford Jackson was extra-murally attached for some years. As a young man he was an athlete of no mean ability, gaining honours especially in boxing and lacrosse. Of late years (Mr. Jackson was seventy-two when he died) he had been more or less an invalid, although always glad to receive the visits of old friends. He is survived by a widow, a son, and a daughter.

MAJOR ANDREW ROBB, T.D.

Old London graduates, and those who served with him in the Great War, will learn with regret of the death of Major Andrew Robb, of Glasgow. Major Robb graduated from the Royal Veterinary College, London, in 1899, was only fifty-seven years of age, and had been a prominent member of the R.A.S.C., Territorial Force, having obtained the Teritorial Decoration. During the Great War he served in France and Egypt, returning to practice as partner with his father and brother in his native town. A clever veterinary surgeon, and of a genial disposition, he had a large circle of friends by whom he will be much missed, and the profession is poorer by his loss.

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